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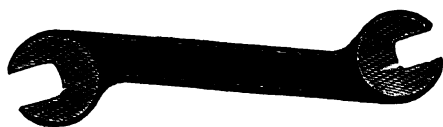
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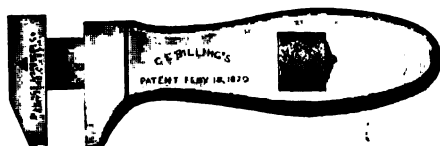
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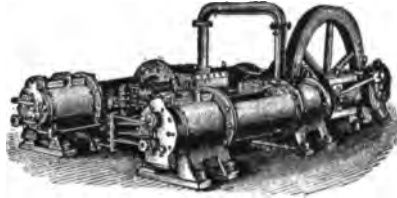


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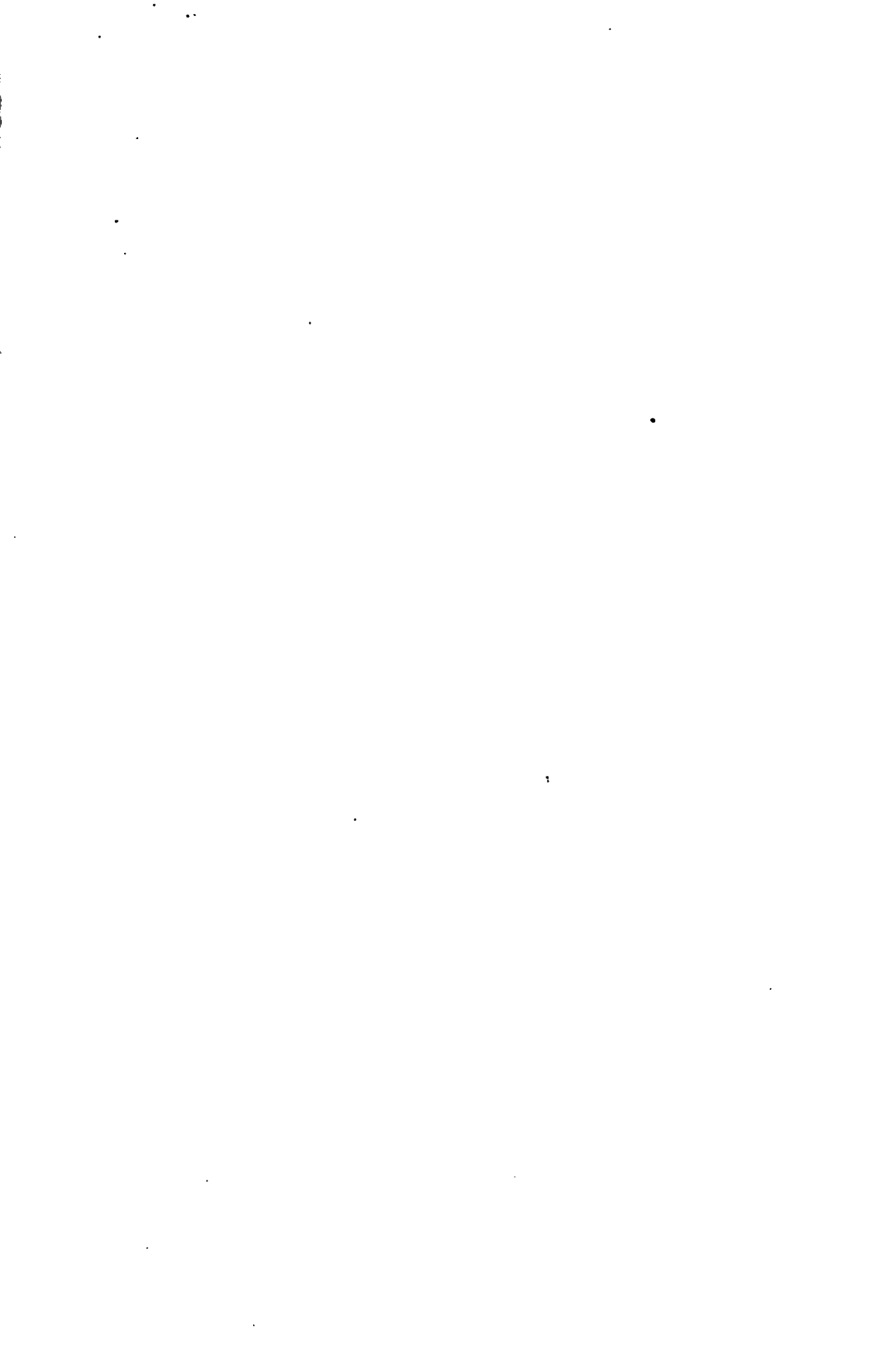
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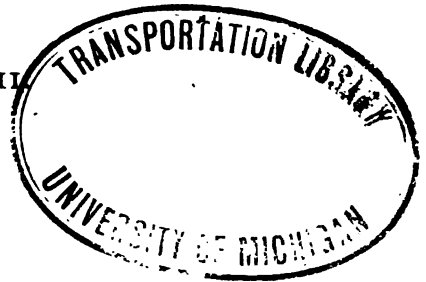
*ENGINEERING; RAILROADS; SCIENCE;  
MANUFACTURES AND TRADE.*

BY

FRANCIS E. GALLOUPE, M.E.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, S.B.; MEMBER AMERICAN  
SOCIETY OF MECHANICAL ENGINEERS, ETC.

—  
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## FROM THE PREFACE TO THE FIRST VOLUME.

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PROGRESS in the development of material resources, in recent years, has created a large and increasing volume of engineering literature in periodicals which contain valuable papers and information, much of which is too recent, or fragmentary in character, to be found in books, or elsewhere.

This work is designed to make accessible to engineers in all branches of the profession, to special investigators, librarians, editors and others, the more important papers and articles contained in leading American and English periodicals during the last five years. To keep the list from becoming unwieldy, it was decided to limit, besides the period covered, the number of periodicals, and with these restrictions the compiler has selected each reference given by personal examination of the articles in the files.

The index is by subjects, alphabetically arranged, and makes available information now practically buried in the mass of engineering literature, or only to be extracted by the aid of some one hundred and fifty indices, and the loss of much time.

BOSTON, *May*, 1888.



## PREFACE.

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THE purpose of this Index is to supply a reference list to the important works and matters relating to engineering and its allied interests, during the period covered. It is believed that no other index fills the field of this work, which shows at a glance the principal information published on any given subject in the leading periodicals during the past five years. The periodicals indexed having been selected from a list of over one hundred and sixty periodicals will, it is thought, sufficiently cover the field of practical engineering, as nearly all important works and matters are contained among these representative papers. Foreign papers are represented by translated articles reprinted in the periodicals indexed, and there are besides incidental references to numerous others.

Within the limits set, the aim has been, by a critical examination of each article throughout the files, to preserve references to all those of permanent technical value, or practical use.

BOSTON, *June*, 1893.



## ABBREVIATIONS.

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<i>addr.</i> address.	<i>discov.</i> discovery.
<i>agric.</i> agricultural.	<i>discuss.</i> discussion.
<i>Am.</i> American.	<i>distil.</i> distillation.
<i>amt.</i> amount.	<i>distrib.</i> distribution.
<i>anal.</i> analysis.	<i>dyn.</i> dynamometer.
<i>ap.</i> apparatus.	<i>econ.</i> economy, economical.
<i>aqued.</i> aqueduct.	<i>effic.</i> efficiency.
<i>atmos.</i> atmosphere.	<i>elec.</i> electric.
<i>aut.</i> automatic.	<i>eng.</i> engineering.
<i>bat.</i> battery.	<i>es.</i> estimate.
<i>Bess.</i> Bessemer.	<i>estab.</i> establishment.
<i>Brit.</i> British.	<i>evap.</i> evaporation.
<i>bull.</i> bulletin.	<i>exam.</i> examination.
<i>cal.</i> calculating, calculation.	<i>excav.</i> excavating, excavation.
<i>capac.</i> capacity.	<i>exhib.</i> exhibition.
<i>cath.</i> cathedral.	<i>exp.</i> expense.
<i>C. E.</i> civil engineer.	<i>expt.</i> experiment.
<i>Cens.</i> Census.	<i>frt.</i> freight.
<i>centrif.</i> centrifugal.	<i>galv.</i> galvanometer.
<i>chem.</i> chemistry.	<i>gov.</i> governor.
<i>condens.</i> condensing, condensation.	<i>h.</i> house.
<i>cor.</i> correspondence.	<i>h. p.</i> horse power.
<i>corrug.</i> corrugated.	<i>hist.</i> history.
<i>Corp.</i> Corporation.	<i>hor.</i> horizontal.
<i>Co's.</i> Companies.	<i>hos.</i> hospital.
<i>cyl.</i> cylinder.	<i>ht.</i> height.
<i>dec.</i> decrease.	<i>hydr.</i> hydraulic.
<i>dept.</i> department.	<i>illum.</i> illuminating.
<i>des.</i> designer, design.	<i>imp.</i> improvement.
<i>desc.</i> description.	<i>inc.</i> increase.
<i>diam.</i> diameter.	<i>incand.</i> incandescent.
	<i>indus.</i> industry, industrial.



<i>ins.</i> insurance.	<i>R.</i> railroad.
<i>Inst.</i> Institute.	<i>recip.</i> reciprocating.
<i>inv.</i> inventor, invention.	<i>refrig.</i> refrigerating.
<i>locom.</i> locomotive.	<i>rep.</i> report.
<i>M. E.</i> mechanical engineer.	<i>resist.</i> resistance.
<i>mach.</i> machine, machinery.	<i>Ry.</i> railway.
<i>manuf.</i> manufacture.	<i>san.</i> sanitary.
<i>max.</i> maximum.	<i>sec.</i> second.
<i>min.</i> minute.	<i>Soc.</i> Society.
<i>mo.</i> motive.	<i>spec.</i> specification.
<i>mt.</i> mountain.	<i>sq.</i> square.
<i>munic.</i> municipal.	<i>st.</i> street.
<i>mut.</i> mutual.	<i>stat.</i> statistics.
<i>n.</i> note.	<i>str.</i> steamer.
<i>nav.</i> navigation.	<i>sup.</i> supplement.
<i>obs.</i> observations.	<i>teleg.</i> telegraph.
<i>pass.</i> passenger.	<i>teleph.</i> telephone.
<i>pat.</i> patent.	<i>temp.</i> temperature.
<i>pneu.</i> pneumatic.	<i>topog.</i> topographical.
<i>pop.</i> population.	<i>util.</i> utilization.
<i>por.</i> portrait.	<i>vac.</i> vacuum.
<i>pph.</i> pamphlet.	<i>vel.</i> velocity.
<i>pro.</i> proceedings.	<i>ventil.</i> ventilation.
<i>proc.</i> process.	<i>wrt.</i> wrought.
<i>prog.</i> progress.	<i>wt.</i> weight.
<i>pyrom.</i> pyrometer.	



## NAMES OF PERIODICALS INDEXED,

WITH THEIR ABBREVIATIONS.

Cassier's Magazine. *Cassier's*  
Electrical Engineer, N. Y. *El Eng*  
Electrical Review, London. *El Rev Lond*  
Electrical Review, N. Y. *El Rev*  
Electrical World, N. Y. *El Wld*  
Engineer, The, London. *The Eng*  
Engineering, London. *Eng*  
Engineering Magazine, N. Y. *E Mag*  
Engineering and Mining Journal, N. Y. *E & Min*  
Engineering News, N. Y. *E News*  
Engineering Record, N. Y. *E Rec*  
Journal of the Franklin Institute, Phila. *F Inst*  
Power, N. Y. *Pwr*  
Proceedings of the Institution of Civil Engineers, London.  
*Inst C E*  
Proceedings of the Institution of Mechanical Engineers, London.  
*Inst M E*  
Proceedings of the Society of Arts, Boston. *Soc Arts Mass*  
Railroad and Engineering Journal, N. Y. *R & Eng*  
Railroad Gazette, N. Y. *R Gaz*  
Scientific American Supplement, N. Y. *Sc Am Sup*  
Street Railway Journal, N. Y. *St R J*  
Technology Quarterly, Boston. *Tech Q*  
Transactions American Institute of Mining Engineers, N. Y.  
*Am Min*  
Transactions American Society of Civil Engineers, N. Y. *Am C E*  
Transactions American Society of Mechanical Engineers, N. Y.  
*Am M E*

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## OTHER PERIODICALS INCIDENTALLY INDEXED IN PART.

American Engineer; Annales des Ponts; Building News, London; Century Magazine; Cosmopolitan Magazine; Forum; Le Genie Civil; Harper's Monthly; Industries; Iron Age; Journal of the Assoc. of Eng. Societies; The Locomotive; New England Magazine; Nineteenth Century; North American Review; Scribner's Magazine, etc.



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Ingersoll Rock Drill Co. \* Mar 28-91 ; Atkinson's *The Eng* \* July 3-91

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NAVIGATION, *Cosmopolitan* mechanical flight, Langley, May, the aeroplane, Maxim, June -92 ; *E Mag* prog., Chanute \* Oct-91, suggestions, Kirk \* Feb -92 ; *E & Min* ed. July 28-88 ; *E News* natural limitation of, J. B. Johnson, Dec 6-90, Mt. Carmel air-ship, ed. \* Feb 21-91 ; *E Rec* Chanute, Mar 14-91 ; *Forum* problem of, Thurston, Jan -90 ; *Inst C E* expts. in aerodynamics, Langley, abs. v 107-92, Smithsonian Contrb., Wash -91, *R & Eng* Chanute \* July, \* Aug, Sep, Philbrick, cor. n Sep, \* Oct, Nov -90 ; *R Gaz* Langley's expts Sep 18-91 ; *Sc Am Sup* Helmer, n \* Jan 17-91 ; parachute, history \* Dec 17-92 ; *The Eng* reaction of air on planes, Lancaster, cor. \* Mar 7-90. See also BALLOONS ; FLYING machines

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PUMPS, mercurial, development, S. P. Thompson *El Eng* \* Feb, \* Apr, \* May -88 ; the Massey, Eames Vac. Brake Co. *R Gaz* \* Dec 6-89 ; mercurial, development, Thompson *Sc Am Sup* \* Jan 21, 28-88, Sprengel, new form, Rawson \* Oct 11-90 ; mercurial, Wood \* Jan 27-91 ; horizontal, Longridge *The Eng* Sep 27-89

PURIFICATION by ozone, new method, Richardson *Sc Am Sup* Sep 28-89

RESISTANCE, experimental study of, Crosby *E News* June 7, 14, laws of, ed. \* June 21, do. Hazen and ed. July 5, 5, correction and ed. 12, 12, Marvin, cor. 19, determination of, do. Sep 27-90 ; at very high vels., Chanute, cor. *R Gaz* Dec 26-90. See also RAILROADS, train resistance

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**Alabama** and Tenn. *Eng* \* Oct 5, \* Nov 2-88 ; iron and coal mines *Sc Am Sup* Sep 20-88

**Alaska**, Yosemite and the Yellowstone *Eng* \* Dec 2-30-92 ; wealth and resources, n *E News* Apr 4-91

**Albert** Victor, Duke of Clarence *Inst C E* v 108-92



- Alcohol** purification by hydrocarbons, Squire (full) *Sc Am Sup* \* Sep 14-89; influence on human system, N. Davis Dec 17-92
- Alcoholometer**, Siemen's *Eng* \* July 22-92
- Alden** George I., por. *Cassier's* \* May -92
- Algebra**, lessons in *Pwr* files -91-92; determinant theorems applic., Tyler *Tech Q* Nov -90
- Alkali** process, ed. *Eng* Apr 13-88; trade, British, notes *E & Min* Sep 13, 20-90, (full) Apr 11, \*18-91; works, analytical methods for, Lunge Feb 14-91, *J. Soc Chem Ind.* See also under CHEMISTRY; NITRATES
- Allan**, Alexander *The Eng* June 12-91
- Allen**, Horatio, memorial notice, Forney *Am M E* v 11 -90; por. *E News* \* Jan 11-90; (full) *R & Eng* Feb, Mar, Apr -90
- Alloyage** and igneous cementation, Elbers *E & Min* Nov 16-89
- Alloys**, strength. Unwin *Eng* Oct 4-89; Roberts-Austen Mar 16, 23, Apr 6-88, do. research committee report Nov 6, 6, \*13-91; do. properties (full) *E & Min* \* Apr 9, 16-92; strength at different temps., Unwin Jan 11-90, do. *The Eng* Oct 4-89; new and eng. applics., Garrison *F Inst* \* June, July, \* Aug, \* Sep -91; Robert's report discuss., insets (full) *Inst M E* \* Oct -91
- Sc Am Sup* Roberts-Austen (full) \* Dec 8, 15, 22-88, strength at different temps., Unwin Nov 23-89, use in art metal work, Roberts \* Aug 2-90, report (full) \* May 28-92. See also STEEL alloys
- ALUMINUM**, and alloys, relative value, Pemberton *El Rev* Oct 6-88; manuf. in electric furnace, Dagger *El Rev Lond* Sep 27-89; copper and manganese, properties, Cowles, abs. *Inst C E* v 106-91, *E & Min* July 11-91. See also ALUMINUM alloys
- BEARING** metal, Dudley *F Inst* Feb, Mar -92, *Sc Am Sup* Apr 2-92
- CHROMIUM** and iron, Hadfield (full) *Eng* Sep 23, 30, 30, \* Oct 7, 14-92; chrome pig iron and steel, Brustlein *R & Eng* Aug -88
- ELECTROLYTIC** decomposition and preparation, Roberts-Austen *El Wild* \* Feb 4-88, Warren *Sc Am Sup* Mar 5-92
- FERRO**-chrome, Brustlein, *E & Min* Feb 1-90; iron and silicon, Hadfield *Eng* Oct 18, 25-89
- MANGANESE**, copper and aluminum, properties, Cowles, abs. *Inst C E* v 106-91, *E & Min* July 11-91
- NICKEL** and iron, magnetic properties, Hopkinson *El Rev Lond*



**Alloys, NICKEL**

Aug 8-90, do *El Wld* \* Sep 6-90; nickel and steel, Riley (full) *Sc Am Sup* Aug 24-89. See also NICKEL alloys

STEEL, and chrome pig iron, Brustlein *R & Eng* Aug -88; and nickel, Riley (full) *Sc Am Sup* Aug 24-89, do. Mar 22-90.

See also STEEL alloys

**Allport, James** *Eng* Apr 29-92, *The Eng* Apr 29-92

**Alphand, Jean C. A.** *Inst C. E.* v 107-92

**Alpine engineering.** Vernon-Harcourt, insets *Inst C E* \* v 95-89

**Aluminum** *Am M E* an expt. with, Christie v 13-92; *Am Min* properties, A. E. Hunt (full) v 18, and other metals compared, Keep (full). v 18-90; *Cassier's* production, E. P. Allen \* Feb, \* Mar -92

*El Eng* problem future, from chemical standpoint, Wahl June 3-91; *El Rev Lond* do Aug 21, Sep 4-91; Guillaume May 8, properties, Hall, June 12-91; *El Rev* (name) 'Alium' for, O. Smith May 30; probable future, Wahl, (full) June 13-91; *El Wld* do (full) June 6, discuss. 13-91; properties, Hall May 30; 'Alium' (name), O. Smith 30-91

*Eng Dagger* Oct 18-89; Hunt, Langley and Hall, Mar 28, Apr 18-90, *E & Min* do. Mar 8, 15, 22-90, Ingalls, Jan 2-92

*E News* Feb 16-89; properties, Hunt, Feb 22, Mar 1; comparative cost Nov 1, production, Hall proc. \* 8-90; Hunt (full) Feb 28, Mar 7, July 11-91

*E Rec* processes, Sep 5-91; *F Inst* Henderson, Oct -88, Roscoe, Sep -89, problem, Richards, Mar -91; *Inst C E* abs. v 110-92, *Dingler's* 284-92; *Locom* Apr -92

*R Gas* Hunt, Apr 29-92; *Sc Am Sup* and sodium, Sep 15-88, Henderson (full) Jan 5-89, present status, Packard, Jan 9, action of liquids on, Lunge, Mar 5, Ingalls, May 28-92, *E & Min*; *Soc Arts Mass* Hunt (full) \* -91, do. inset *Tech Q* \* Apr -91; *The Eng* Aluminium Co. Aug 3-88; *Tech Q* in iron and steel, direct det., Drown, Oct -91

**ALLOYS, Cowles, smelting, Heroult proc., Dewey** *Am Min* v 18, \* 18-90; manuf. in elec. furnace, *Dagger El Rev Lond* Sep 27-89, do *El Rev* Oct 19-89, do *El Wld* Nov 9-89; Heroult proc. *Eng* Oct 10-90; improvements in manuf., n *E & Min* May 24-90, *J Soc Chem Ind*; by Heroult proc. *E News* Sep 8-88; relative value *F Inst* Oct, correction, Pemberton, Nov -88; produced by elec. furnace, Langenhove, abs. *Inst C E* v



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### Aluminum, ALLOYS

91-88, *Assoc Ings Liege* -87; Bobby *Sc Am Sup* Feb 2, (and silicon) production in elec. furnace (Cowles proc.), Dagger (full) \* Nov 30-89

BRONZE and brass, as materials for propellers, Cowles *Am Min* v 18-90; do (full) *Sc Am Sup* Apr 12-90; bronzes, diagram *E News* \* Feb 8-90

CARBURETTED iron, in, Keep *Eng* June 27-90

CAST iron, in, Keep *Am Min* v \* 18-90; ed., Keep *Eng* Aug 31, 31-88; do *E & Min* \* Aug 18-88, do. \* Jan 25-90

CASTNER, sodium and aluminum procs. *E & Min* \* Aug 18-88 *Eng*

COWLES proc. in England *El Wld* \* Sep 29-88

DEVILLE-Castner proc. *Eng* Mar 22-89

DRAWING press, al. in, O. Smith *Am Min* v \* 18, 18-90, do. *Eng* \* Aug 29-90

ELECTRIC production, Brown *El Eng* \* Apr 29-91, do *El Rev Lond* May 22, 29, June 26-91, do *El Rev* May 2-91, do (full) *El Wld* May 2, Crocker, discuss. 16-91; Stoke-on-Trent plant, England (full) *E & Min* \* Sep 22-88; reactions, Bucherer, Jan 6, Farmer, 27-91; elec. smelting, Bobby *Sc Am Sup* \* July 13-89; Farmer, July 25, reactions in Aug 1-91

FERRIC cake (for sizing paper) *Sc Am Sup* Nov 9-89, *Chem Tr J*  
FLUORIDE, electrolysis of, Minet *El Eng* Dec 10-90, *El Rev Lond* Dec 19-90, *Compt R*

GRABAU's method, ed. *Eng* Dec 20-89, abs. *Inst CE* v 101-90, *An Mines*, *Genie Civil* v 16-89, v 17 May -90

HEROULT proc., Dewey *Am Min* \* v 18-90; *El Wld* \* Nov 17-88, \* *Industries*; *Eng* Oct 10-90; (full) *E & Min* Dec 1-88, and Cowles, Lowrey cor. Apr 27-89; Grabau's method, abs. *Inst CE* v 101-90, *Genie Civil* v 16-89, 17 May -90; *Sc Am Sup* \* Dec 8-88

INSTRUMENTS of precision, Blake *Am Min* v 18-90

MANUFACTURE and industry, value, Dagger, ed. *El Rev Lond* Apr 8, July 15, Aug 19, Sep 2-92; Deville-Castner proc. *Eng* Mar 22, ed. \* Aug 2-89, Lauffen-Venhausen works \* Feb 20-91; improvements in, n *E & Min* May 24, Grabau's method, Ichon Aug 16-90, *An Mines*; and uses, Hunt *E News* May 5, expt. with, Christie 19-92, do., Hunt (full) *F Inst* Apr -92; extraction on a commercial basis, Seymour, Roscoe (very full) *Sc Am Sup* Aug 24-89, Hall proc. \* Feb 1, (pure) (full) \* June



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- 7-90, value, *Dagger* Aug 15-91, Hunt (full) Apr 23, May 14 etc -92; *The Eng* \* Nov 21-90
- ORE, Nichols, n *Am Min* v 18-88
- RAILROAD work, in, ed. *R Gaz* Nov 14-90, Hunt, Mar 27-91
- SPECIFIC heat of, Richards *F Inst* Feb -92
- STEEL, in steel castings, Keep *Am Min* \* v 18-90, Hadfield (very full) v \* 19-91, in steel ingots, Langley, iron and steel direct determination, Drown, McKenna v 20, 20-92; Keep *Eng* May 23-90; strength, etc. (full) *E News* Oct 11-90; Hadfield *Sc Am Sup* Apr 4-91
- SULPHIDE proc. and ap., Emanuel's *Sc Am Sup* \* Feb 6, formation, Bucherer, Dec 24-92, *Chem Trade J*
- TESTS *Eng* May 2-90; transverse strength *E News* Mar 15, (full) Oct 11-90
- U. S. production, Packard *E & Min* July 11-91
- USES, Hunt *R & Eng* July -92; and applics., Addenbrooke *Sc Am Sup* June 18-92, *J Soc Arts Lond*; *Dagger The Eng* June 6-90
- WROUGHT iron and steel castings, in, Keep *E & Min* Aug 30-90, *Am Min*
- Amalgams**, electric conductivity of, Weber, abs. *Inst C E* v 92-88, *Central Elek* -87
- America**, Fourth centennial Spanish exhib. *F Inst* Jan -92; improvements (boasting), Sweet *The Eng* May 6-92, *Am Machinist*; manufactures, recent growth *The Eng* Nov 25-92; American Powers conference, Henderson *Sc Am Sup* June 22-89. See also UNITED STATES
- Ammonia** and tar recovery from blast furnace gases *E & Min* \* May 12, 19-88; liquor utilization, Humphreys *Sc Am Sup* May 19, use as refrigerating agent, Lightfoot, 26-88, production from coal, Mond (full) \* Sep 28-89; properties, De V. Wood *Am M E* \* v 10-89, experimental determination of latent heat of, Jacobus \* v 12, 12-91; liquid, composition and manufacture, Strombeck *F Inst* July, n Aug -92. See also under CHEMISTRY
- ENGINES, aqua, theory and tests on Edison incand. lighting plant, Magovern *Am C E* \* v 19-88, ed. *The Eng* July 19-89
- Ampere**, Andre M. n *Sc Am Sup* Dec 1-88
- Anæsthesia**, discovery *Locomotive* Nov -89, anæsthetics, Chis-olm *Sc Am Sup* Apr 21-88



- Anderson**, Henry J. C. *Inst C E* v 106-91
- Anemometers** testing, Gieseler *E Rec* \* July 13-89
- Angle**, the economical, Honey *Sc Am Sup* \* Jan 17-91
- Angle-iron** bevelling machine *The Eng* \* June 6-90; tests, Loweth *E Rec* Feb 1-90, *J Assoc E Socs*
- PRISMS**, Gieseler *E News* \* May 12-88
- Animals**, animal arithmetic, Royer *Sc Am Sup* Feb 2-89, *Pop Sci*; as a motor-machine, Thurston *Cassier's* Feb -92; how the world appears to, *Sc Am Sup* Jan 12-89; language of, Duthiers Feb 13-92, *Pop Sci*
- Annealing** iron or steel, non-oxidizing proc., H. P. Jones *E News* \* Jan 2-92
- Antagonism**, Grove *Sc Am Sup* June 9-88
- Antartic** exploration, Griffiths (full) *Sc Am Sup* Jan 10-91
- Anthony**, W. A., por. *El Wld* \* Feb 1-90
- Antimony** ore dry concentration, Heard *E & Min* Feb 23-89, Kemp, Jan 2, smelting, English proc., Rodger, Mar 12-92, *J Soc Chem Ind* Jan 30-92; *Locom* May -92
- Anthropology**, Evans *Sc Am Sup* Nov 15-90; anthropolog. work in Am., Starr *Pop Sci* \* July -92
- Apatite** mining in Canada *Sc Am Sup* Dec 8-88, *E & Min*
- Aransas Pass**, Texas, imp. *E News* \* Aug 30, Haupt, cor. \* Sep 13-90
- Arc**, length of, method of determining, Hartl, abs. *Inst C E* \* v 107-92, *Zeit Deut Ing* -91
- Arch**, Arthur J. E. *Inst C E* v 101-91
- Archbould**, Ralph *Inst C E* v 101-90
- Archæological** discovs. in Ohio *Sc Am Sup* \* Aug 27-92, *Cal Mag*
- Arches**, masonry, stability of loaded, Wurtele, and discuss. *Am C E* \* v 23-90; the arch, Richardson *Eng* \* Jan 13-88; do. *Sc Am Sup* \* Mar 3-88; templet for, various thickness *E News* \* Mar 8-90; wet, German method of repairing \* Dec 13-90; max. stresses, Werner (full) *F Inst* \* Oct, inset \* Nov Dec -92; arched ribs and voussoir, Martin *Inst C E* \* v 93-88; dead and live loads on masonry, McClintic *Lehigh Eng J* June-88; error in theory of masonry, Baker *R Gaz* \* May 31-89
- EQUILIBRIUM**, curves, Suplee *Am M E* \* v 11-90
- GOUR Noir** viaduct, Vezere river, Uzerche, France, inset *E News* \* Aug 18-92



**Arches**, Mt. Vernon viaduct *E News* \* Sep 1-92

SEGMENTAL and two-nosed catenaries, Alexander *Eng* \* July 12-89

SKIEW or spiral construction, Cincin. & Rich. R., Paret *Lehigh Eng J* Feb -88. See also BRIDGES, skew arch, Oakley.

**Architects**, Am. Inst., pro. *E Rec* Oct 27-88, constitution, Dec 7-89, pro. Oct 31, Nov 7-91

**Architect's** and engineer's fee, German schedule *E Rec* June 15; convention Nov 30-89; legal decision, Dec 15, 22-88; the architect and the engineer, ed. *R & Eng* Dec -90, *Pop Sci*; offices, Burnham, Rookery, Chic. *E Rec* \* Jan 11, Shepley \* Feb 15, Wilson, Phil. \* 22, Chandler, Phil. \* Mar 1, Boston, June 7-90, organization, Post, N. Y. \* Nov 7, McKim's, N. Y. \* Dec 5-91

WESTERN Assoc. pro. *E Rec* Dec 1-88

**Architectural** work, J. Robinson *E Mag* \* Mar; notes, Ferree, files to Dec -92; constructive faculty, evolution of, Burnett, Aug -92, construction, Monier system *E & Min* \* June 6-91; decoration, World's exhib., Millet *Scrib* \* Dec -92

DESIGN, elements of, Statham (full) *E Rec* \* Jan 14-88, do. (full) *Sc Am Sup* \* Feb 18, 25 \* May 19, 26 \* June 9, 16-88; logical basis of, Walker *Tech Q* May -90; engineering, Freitag *Sc Am Sup* \* Aug 22-91

**Architecture**, art and utility in building, Ferree *E Mag* Aug, recent tendencies do. \* Sep -91; pessimism of modern, Edelmänn, insets \* Apr; beginnings of, Kirk \* May; ornament in, Sullivan, insets \* Aug; in wood, protest, Kimbrough, Dec -92; physiological basis of the sense of beauty of form, Goodman (full) *Sc Am Sup* May 10-90. See also BUILDINGS and building AMERICAN Fine Arts Soc. bld., N. Y., doorway, inset *E Rec* \* Dec 31-92

APARTMENT house, Yosemite, N. Y., entrance *E Rec* \* June 27-91

CATHEDRAL, Albi, France, inset *E Rec* \* Apr 18-91; builders of the cathedrals, Snow *NE Mag* \* Dec -92; Siena cath., Pisano *Sc Am Sup* \* Oct 19-89

CHATEAU Epreville-Martainville, France, inset *E Rec* \* Sep 26; (Lot) France, inset \* July 25-91; Josselin, Brittany, inset \* Jan 23-92

CHICAGO, Ill., Herald building, inset *E Rec* \* Nov 14-91; sketches in *Sc Am Sup* \* Dec 3-92



**Architecture**, CHURCH at Chateaufneuf (Charente), France, inset *E Rec* \* Sep 19; of St. Paul, Dax (Landes), France \* June 6-91

CITY Hall, the, in Am., Ferree, insets *E Mag* \* Nov -92; Bremen, Germany, inset *E Rec* \* Dec 12-91; Cologne, Ger., entrance, inset \* Apr 2; Hotel de Ville, Poitiers, France, inset \* Dec 10-92

CLUB house, Century, N. Y., doorway, inset *E Rec* \* Dec 19-91; Montauk, Brooklyn, inset \* Apr 9; Catholic, N. Y., inset \* Dec 17-92

COLUMBIAN exhib., U. S., Chicago, Van Brunt *Century* \* May—\* Aug -92

COUNTRY houses, Cambridge, etc., inset *E Rec* \* Jan 17-91; Cohasset, Mass., interior, inset \* Apr 23-92; English, inset \* Aug 29-91; Arthur Little's, Boston, inset \* Feb 20; Geo. Macculloch, Morristown, N. J., inset \* Mar 26; Marblehead Neck, interior, inset \* Jan 16-92; Swampscott, Mass., inset \* Aug 15, Elihu Thomson's do., inset \* May 9-91

COURT house, Beauvois, France, inset *E Rec* \* Nov 19-92

FRANKFORT-on-Main, Ger., Union R. pass. station, insets *E Rec* \* Sep 5-26 \* Dec 5-91. See also BUILDING

GALLERY Victor Emanuel, Milan, inset *E Rec* \* July 30-92

LIBRARY, Tilden Trust, N. Y., proposed, Bigelow *Scrib.* \* Sep -92

MEAT market, old, Haarlem, Holland, inset *E Rec* \* Feb 14-91

MOBBERLY Hall, Cheshire, England, inset *E Rec* \* Nov 26-92

MUSEUM building and arrangement, Ferree *E Mag* \* Nov -91; Amsterdam, Holland, inset *E Rec* \* Feb 28; Hague, do., inset \* May 23-91

MUSIC Hall, N. Y., main entrance, inset *E Rec* \* Feb 13-92

PALACE of Justice, Hague, Hol., inset *E Rec* \* Mar 7-91

RECEIVING vault, Woodlawn cem., N. Y., inset *E Rec* \* Feb 27-92

RESTAURANT, Frankfort Palm garden, inset *E Rec* \* Oct 31-91

ROMERBURG, Germany, inset *E Rec* \* Dec 26-91

SWISS Vecchia inn, Maloja Pass, inset *E Rec* \* Apr 16-92

**Arctic** exploration, Peary expedition, Nansen's No. Pole exped. *Sc Am Sup* \* Nov 26, 26-92

**Areas** of segments *Locom* \* Jan -90, calculation, table, June -91. See also INTEGRATOR

**Argall**, Philip, por. *E & Min* \* Dec 5-91



- Argentine Republic**, ed. *Eng* Dec 27-89; finance *E & Min* Apr 20-89; R. map *E News* \* Dec 8-88; Jan 28-89; notes, Shunk, Feb 22, Mar 22-90; wheat in *Sc Am Sup* Apr 14-88
- Arithmetic**, curiosities in figures *E News* Dec 29-88; peculiarities of the figure 9, Hill, cor. Feb 2-89; Hindu May 10; the number 142,857, cor. n Oct 25-90; lessons *Pwr* files -91-92; method of quarter squares, Blater, Glaisher (full) *Sc Am Sup* Nov 30-89; cube root, Wood Sep 6, do. and rapid addition, Boutelle. Nov 8-90; roots extracting, new method, Westervelt Apr 4-91. See also under MATHEMATICS
- Arkansas mines**, Branner, *E & Min* Oct 20-88
- Armada** (Spanish), defeat in 1588 *Sc Am Sup* \* Aug 25-88
- Armor**, cellulose *E News* Dec 1-88, steel, tests at Annapolis, Sep 20, 27 \* Oct 4-90. See also GUNNERY and armor
- Arms and armor** of ancient Japan, Baba *Soc Arts Mass.* -88
- Army**, Austro-Hungarian, Kuhn *Harper's M* \* June; Italian, Goiran \* Aug -92; European armies, Dodge *Forum* July -92; of Kukuanaland, Michaelis *Sc Am Sup* Oct 26-89, *F Inst*
- Arrol**, William, por. *Eng* \* Feb 28-90
- Arsenal**, Woolwich *The Eng* \* Oct 2-91
- Arsenic** determination, Canby *Am M E* v 17-89, *Birm* May -88; *Locom* June -92
- Art**, fine, composition and selection of a subject, Ellis *Sc Am Sup* \* June 1-89; use of cloisonne for decoration, Heaton (full) May 9; pictures, durability painted with oils and varnishes, Laurie June 20; Miller, Aug 22; decorative treatment of natural foliage, Stannis (full) \* Nov 21, 28 \* Dec 5, 19, 26-91
- Artesian wells**. See WELLS, artesian
- Artificial limbs**, Mark's *F Inst* \* May -89
- Artillery** service in the rebellion, Tidball *J Mil Ser Inst Mag* May -92. See also GUNNERY and armor; GUNS
- Arts and manufactures**, prog. rev. *F Inst* Feb -88. See also SOCIETY of Arts, London
- Asbestos** *E & Min* Jan 2-92; Rogers *Sc Am Sup* June 16-88; Canadian industry *E & Min* Sep 17-92; chem. composition, Donald, June 27-91, do. *Sc Am Sup* July 18-91; mining, Quebec. Ells *E & Min* Apr 25-91, Canada, abs. *Inst C E* v 107 -92, *Am Gas Lt J* Oct 26-91; U. S. production, Parker *E & Min* Sep 5-91, *Cen Bull*; mining, manufac. and uses, Fisher *The Eng* Dec 16-92



**Ashburner**, Charles A., Lesley *Am Min* v 18 -90

**Ashworth**, John *Inst C E* v 95 -89

**Asphalt**, uses, Greene, insets (full) *Am Min* \* v 17 -89, do. *Soc Arts Mass* -89; industry, France, abs. *Sc Am Sup* \* July 19-90, *Genie Civil*; plates for water-proof construction *E News* \* Nov 1; price of, Oct 25-90; Trinidad *E Rec* Nov 12-92; use in irrig. works, Cal., Purcell *Inst C E* v 110 -92; nature and uses, Greene *Soc Arts Mass* -89. See also PAVEMENTS; ROADS; STREETS

**Asphalto-genesis** theory, Wurtz *E & Min* July 27-89

**Asphaltum**, Gilsonite or Uintahite, mts., Utah, Locke *Am Min* v 16 -88, Blake v 18 -90; and ozokerite, U. S., Parker, cenbull. *E & Min* Aug 15-91; Kemp, Jan 2-92; Parker *E Rec* Aug 1-91; *Sc Am Sup* Sep 19-91

**Assaying** of lead, silver and gold, F. Clark *Tech Q* May -88; tin ores, dry, Hofman (full) May, Aug -90. See also CHEMISTRY; METALLURGY; METALS and names of metals and minerals

**Astronomy**, two remarkable coincidences, d'Auria *F Inst* Oct -88; as applied to land surveying, Downes *Inst C E* \* v 108 -92; recent science, Kropotkin *19th Cent* May -92; how to measure the invisible, Parkhurst *Sc Am Sup* Apr 18; the story of the universe, Huggins \* Sep 12; central lateral motion of the worlds of space, Wheeler, Dec 5; astronomer's work in a modern observatory 19-91; new, Ball, Feb 27-92. See also PHOTOGRAPHY, stellar; SUN; TELESCOPES, etc.

ABERRATION problems, Lodge *Sc Am Sup* \* Nov 5-92

ARCTURUS, recent conceptions, Knight, *Sc Am Sup* July 4-91

AURORA Borealis *Sc Am Sup* Mar 16-89

COMETS and meteors *Eng* Dec 30-92; five-fold *Sc Am Sup* \* Feb 18-88; Coakley, Dec 10-92

COSMOSPHERE for teaching, Bailey *Soc Arts Mass* -88

HELIOMETER, Cape of Good Hope observ. *Eng* \* Jan 3, 10 -90

HELIOSTAT, Grubb's, Smithsonian Inst., Wash. *Eng* \* May 16-90

INSTRUMENT works, Grubb's, Dublin *Eng* Dec 14-88

LICK observatory, Mt. Hamilton, Cal. *Eng* \* July 6, 27, inset \* Aug 10, 17, 31 \* Sep 7 \* Oct 26-88; Holden *Sc Am Sup* Sep 29-88; latest discovs. Nov 15-90. See also PHOTOGRAPHY, ap., Lick observ.



- Astronomy**, MARS, map *E News* \* May 18-89; physical aspects, map *Sc Am Sup* \* Sep 8-88; *Science*, do. and views, Proctor *Sc Am Sup* \* Oct 13-88, *Knowledge*; opposition, Lockyer *Sc Am Sup* \* Oct 15-92
- MERCURY *Sc Am Sup* \* Apr 26-90
- METEORITES, meteors *Locom* July -90; August *Sc Am Sup* Oct 13-88; notes, Lockyer (full) \* Feb 2; and what they teach, Hensoldt, Nov 16, 23-89; Wash. Co., Kan. Aug 23-90; meteoric finds, Foote, Feb 6-92; *Nature*; *Science*. See also ASTRONOMY, comets.
- MILKY way, Gore *Littell's* Apr 30-92
- NEPTUNE, discovery (great discoveries) *Locom* Dec -89
- OBSERVATORIES, Levander *Sc Am Sup* Aug 20, (full) Sep 5-91; Halsted ob. spectroscope *Eng* \* July 22-92; Pekin ob. *Sc Am Sup* \* Jan 12-89; Warner ob. *Eng* \* Jan 27-88. See also ASTRON., Lick-Sayre observs.
- SAYRE observ., Beth., Pa., deflection of plumb line at, Frescoln *Lehigh Eng J* June -88
- SPACE, constitution of, Hirn, bk. review *Eng* Nov 8-89, do. *Sc Am Sup* Jan 11, do. De V. Wood, Apr 5; the grants of starry space, Jan 25-90
- SOLAR spectrum, limit of, Hartley *Sc Am Sup* May 4-89, *Nature*
- STARS, in handle of big dipper, simultaneous culmination method, Marcy *E News* \* Sep 5-91; two extraordinary, Pickering *Locom* \* June -90; double \* Oct -91; age of the, Janssen *Sc Am Sup* Jan 28, Feb 4-88; distances, Oudemans, Mar 8-90; double and multiple, Knight, Oct 8-92
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- URANIA Institute, Berlin (Lick observ.), Holden *E Mag* \* Mar -92; planet Uranus, Gregory *Sc Am Sup* Aug 24-89
- VENUS planet *Sc Am Sup* \* Nov 12-92
- Atchison**, Arthur T. *Inst C E* v 105-91
- Atkinson**, Charles R. *Inst C E* v 100-90
- Atkinson**, William P. *Tech Q* May -90
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- Atmosphere**, structure and cause of rain, Velschow *Am C E* \* v 23-90; vertical distribution of temperature *Eng* Nov 1, 16,



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**Avalanches**, Col., Fernow *Am Min* v 18-90; in Austria and Switzerland, Pollack *R Gaz* Sep 25-91. See also MOUNTAIN slide, Curtis; RAILROAD snow protection, slides, Selkirk mts., Canada

**Ayrton**, W. E. por. *El Wld* \* Dec 20-90, do. *Sc Am Sup* \* Mar 19-92

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**Bags and bagging**, Arkell *Sc Am Sup* Aug 4-88

**Baker**, Benjamin, por. *Eng* \* Feb 28-90

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**Baling press**, Boomer portable *The Eng* June 29-88, Cyclone hydr. \* Sep 4-91

**Ball and socket joints**, White's adjust. extension, com. rep *F Inst* \* Aug -89



- Ballard**, Stephen *Inst C E* v 104 -91
- Balls**, hollow copper *Locomotive* \* Oct -91
- Balloons**, how to cross Africa in *Rev of Revs* Sep -92; construction, Myers *Sc Am Sup* Nov 30-89, history of aeronautics, Stevens (full) \* Feb 22, \* Mar 1-90. See also AIR navigation
- Bancroft**, Hubert H., por. *Sc Am Sup* \* Oct 15-92
- Band-saw** mill, the Am., Suplee *Cas* \* Feb -92; saws for heavy timber, ed. *Eng* Aug 30-89
- Barium** (metal) *Locom* Aug -92
- Barnes**, F. W., por. *E & Min* Jan 16-92
- Barometers**, Gieseler *E News* Aug 4-88, the aneroid, do. *F Inst* \* Nov -89, do. use for measuring heights *The Eng* Mar 13-91, do. use in Western Mass. by Geol. survey, Cutter, *Tech Q* Sep -87
- Barrel** machinery, universal *The Eng* Sep 20-89
- Barrels**, cement, etc., cubic capac. n *E News* Feb 15, 22, Mar 29-90
- Barrett**, John P., por. *El Wild* \* Dec 6-90
- Barry**, William H. *Inst C E* v 100 -90
- Bartol**, B. H. *Am M E* -88, *F Inst* June -88
- Barytes** and umber mines and refining mills, Cleator Iron Ore Co., Caldbeck Fells, Addison, inset *Inst C E* \* v 102 -90
- Bassett**, Alexander *Inst C E* v 92 -88
- Bateman**, John F. L. (full) *Inst C E* v 97 -89
- Bates**, Henry W., por. *Pop Sci* \* Nov -92
- Batterbee**, Ranson C. *Inst C E* v 95 -89
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- Bayly**, George H. *Inst C E* v 93 -88, 98 -89
- Bayonne**, Port of *Eng* \* Dec 8-89
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- F Inst* jointed bow, theory, Werner \* May-\* July, Sep, Oct; continuous, indeterminate multipliers, Lindenberg, Dec -88
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**Becker**, Max J., por. *E News* \* Feb 9-89

**Beckley**, John N., por. *St R J* \* Sep -92

**Becquerel**, Edmund, por. *Sc Am Sup* \* July 4-91

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- Berliner**, Emile, por. *El Eng* \* Nov 19-90
- Bernays**, Edwin A. *Inst C E* v 91-88
- Berwind**, Charles P., por. *E & Min* \* Dec 13-90
- Bessemer**, Ala. *Eng* \* Aug 22-90
- Bessemer**, Henry, autograph letter on iron and steel metallurgy and success of his invention, Kitson addr. *Am Min* \* v 19-91; por. *Sc Am Sup* \* Aug 29-91
- Best**, Stephen C. *Inst C E* v 109-92
- Beton** manufacturing and lifting ap., Port of Bilbao *Sc Am Sup* \* Nov 19-92. See also CEMENTS and mortars
- Bevel** gear cutting machine, Paris exhib. *Eng* \* Nov 8-89
- Beverages**, Simmonds *Sc Am Sup* June 30-88
- Bibliography**, Pantobiblion, Internat. Rev. of World's Scientific Literature, Kersha, ed., St Petersburg, notice *R & Eng* Aug -91. See also INDEX
- Bibra**, Charles F von *Inst C E* v 100-90
- Bicycles**, exhib. *Sc Am Sup* \* Mar 30-89, Stanley exhib. \* Mar 29-90, what keeps them upright, McDiarmion, cor. \* Oct 29-92; Stanley exhib. *The Eng* Feb 10, 17, 24-88, \* Feb 22-89, \* Feb 7, 14-90, \* Feb 13, 20, \* Dec 25-91
- Bidder**, G. P. (mental cal.), Pole *Inst C E* v 103-91
- Bigg-Wither**, Thomas P. *Inst C E* v 103-91
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- Biology**, protoplasm and cells, recent science, Kropotkin *Nineteenth Cent* May -92
- Bird**, James B. *Inst C E* v 109-92
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- INSPECTION, and registration bill, English, '91 *Eng* Mar 13-91; Am. reports, Hartford Steam Boiler Insp. & Ins. Co. *Locom* files 88-92; insurance and Bd. of Trade *The Eng* Sep 28-88
- KEROSENE oil, use in, for preventing formation of scale, Lyne *Am M E* \* v 9 -88, Carpenter, n v 11 -90, *E News* May 24 -90, *E Rec* Dec 31-87, *Sc Am Sup* Feb 11-88
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SERPOLLET's instantaneous generator, *El Wld* \* Nov 23-89; Kennedy, expts. *Eng* Sep 18-91. See also STEAM carriage, Serpollet's

SETTINGS, (external furs.) Willimantic I & Steel Co. *E News* \* Oct 13-92; over a single furnace *Locom* Apr -89; numbers of bricks in, Nov -91; *Pwr* Aug -90

STEAM drums, attachment of nozzles to *Locom* Feb -88; dome bracing \* June \* July; nozzles attach. \* Aug -90

STEAM pipes connections *Locom* \* Aug -90

STRENGTH of shells, expts., J. Scott *Eng* \* Apr 26-89; stay, Yarrow's tubular \* Nov 7-90; short, strength of \* Apr 17, cor. \* May 15-91; stay-bolts prob., ed. *E News* Mar 21-91; new steel boiler, expt. test, Scott *Locom* June -89; heads, unbraced wrt. iron \* Feb; hydr. tests, Nov -90; bursting pressure \* Feb, stayed surfaces (full) \* Mar -92; bracing and stay-bolts *Pwr* \* Sep -91; bursting pressure of cylindrical *Sc Am Sup* \* Mar 26-92. See also BOILERS, bracing—riveted joints

STOKERS, aut. conveyor *Eng* \* June 14, 28-89; plant with, Curtis Davis, Cambridge, Mass. *E News* \* Dec 1-92; machine stoking, discuss., insets *Inst C E* \* v 104 -91; Roney stoker *Pwr* \* Aug -89; mechan., Whitham (full) \* July -91, Roney *St R J* \* Aug -89; mechan., Roney (full) July -91. See also MECHANICAL stokers

TESTS and trials, expts., Donkin *Eng* July 4 \* 18 \* Aug 1 \* Nov 21-90 \* Feb 27, May 15 \* Oct 2-91 \* Mar 18 \* July 22 \* Oct 21-92; and fuel econ., Holliday, inset *Inst C E* \* v 92-88; overheating expts., Hirsch, abs. v 108 -92, *Bull Soc E Socs* -90; Otis Co's mills, Ware, Mass. *Locom* \* Mar, equiv evap. Apr -90; clean and foul boilers, comparative, July -92; duty, factors of evap., table *Pwr* Feb, Mar, May, Sep -89, how conducted \* July -92; Barrus, bk. review *R & Eng* Apr -92; with natural and forced draft, Spence *The Eng* Feb 17-88



- Boilers, tests, BABCOCK and Heine, comparative, Emery, report**  
*St R J* Apr -92
- BABCOCK & Wilcox, Longridge, report** *Eng* \* July 11 \* Dec 19-90
- BLAST** furnace waste gas as fuel, effic., Jacobus *Am M E* v 17 -89
- COIL** boilers, Gov't. *E News* Oct 13-88; Ward's coil, U. S. Navy \* Aug 29-91
- DONNELLY's** pat. grate, Schneider, abs. *Inst C E* v 92 -88, *Zeit Dampf* -87
- DOWNWARD** draft, Complete Combustion Co.'s tubular, Galloupe *E News* Mar 23 \* Sep 7-89, Galloupe *F Inst* Feb, Lozano, cor. May -88
- LANCASHIRE**, evap. of, Longridge *Eng* Apr 11, 18-90, do. *The Eng* \* Feb 14-90, Nov 6-91; three-flued, Crosland, Mar 11-92
- OVAL**, two-flues, evap., abs. *Inst C E* v 91 -88, *Zeit Verb Dampf* -87
- PORTABLE**, W. Webber *Am M E* \* v 18 -92
- RED-hot** furnace crown expts., McKean *Cassier's* Jan -92; do. explosions *Eng* Jan 30 \* Feb 13 \* Mar 6, 13 - Apr 17-91, do. *Pwr* \* Nov -90
- STEEL**, open-hearth, use and testing for, Goodall, discuss. (full) *Inst C E* \* v 92 -88
- WARD's** sectional *Eng* \* Apr 5-89
- WATER-tube**, Knap *The Eng* May 25-88
- TUBES**, leaky *Pwr* \* Sep -92; Serve's ribbed *Eng* \* Mar 22-89, Oct 24, 31-90, *E News* \* Nov 8-90, \* May 9-91, *R & Eng* \* Aug, *R Gas* May -91, *The Eng* \* Apr 19-89 \* Oct 31-90
- WATER-tube**, Babcock & Wilcox, test, Longridge *Eng* \* July 11 \* Dec 19-90, Dec 23-92; Thornycroft, abs. *Inst C E*, *R & Eng* Feb -90; Almay's, corrug. mul. steam gen. *Pwr* \* Oct, Oct -90; Seller's \* Oct -91; circulation in, Krauss \* Dec -92; Sibley coll., Thurston *Sc Am Sup* \* Apr 14-88; Yar-row's *The Eng* \* Jan 16; Mill's \* Dec 4-91. See also **MARINE** boilers, water-tube
- Bolden**, Henry *Inst C E* v 109 -92
- Bolivia**, mineral resources, Minchin *Eng* \* July 11-90, Apr 17-91
- Bolton**, Francis J. *Inst C E* v 93 -88
- Bolts**, drift, holding power, expts. *E News* Feb 28-91, *E Rec* Nov 29-90



- Book** binding machinery, Paris exhib. *The Eng* \* May 3-89
- Book-keeping**, Child *E Mag* Aug -91
- Books**, in library *F Inst* Sep -88. See also BIBLIOGRAPHY; ENG. literature; INDEXES, etc.
- Booth**, J. C. *F Inst* July -88
- Boothby**, Alexander C. *Inst C E* v 97 -89
- Boots** and shoes, manuf. of, Rich *Pop Sci* \* Aug -92
- Borax**, history in U. S. *E & Min* Sep 10-92; manuf., Witting, Dec 22-88, *J Soc Chem Ind*; California, Hake (full) *Sc Am Sup* \* Jan 18-90; sources and applics., Fleming, July 4-91. See also under CHEMISTRY
- Boring** machine, for angular holes *E News* \* Mar 21-91; hand power diamond (for ore deposits), Nordenström, abs. *Inst C E* v 99 -90, *Jern Kontorets An* -88, *Oest Zeit Berg* v 37. See also DRILLS; MINING; QUARRYING
- Boston** Heating Co's plant, Abbott, insets *Am Min* \* v 16 -88, *Eng* \* Aug 30, \* Sep 6-89
- Boston**, Mass., U. S. *Eng* \* June 15, 15, 22, 29-88; harbor improvements *E News* Sep 22-88; houses, tenement, Mar 2-89
- MUNIC. eng., City eng'r's rep. '89 *E Rec* Apr 5-90; parkways, road and drainage construction *E News* \* Sep 15-88; passenger traffic *R Gas* June 17-92
- RAPID Transit Commission rep. to Mass. Legislature, Apr 5-92, abs. *St R J* May -92; proposed sys. *E News* Mar 14, European practice, Howes, Dec 5-91
- STREET pavements *E News* May 12, st. sprinkling, June 2-92; st. dept. report *E Rec* Apr 23-92
- Bottle** manufacturing by machinery, glass, Ashley *Eng* \* Oct 11-89; do. German, Partello *Sc Am Sup* June 30-88
- Boulanger**, General, por. *Sc Am Sup* \* July 7-88
- Bourdeaux**, John *Inst C E* v 104 -91
- Bower**, John *Inst C E* v 92 -88
- Box** nailing machine, Hodge's *Eng* \* Mar 29, 29-89, *The Eng* \* Mar 22-89
- Brain**, cerebral radiation, Houston *El Rev* June 4, *F Inst* June; discovs. in anatomy and physiology of, Putnam *Tech Q* Apr -92
- Brakes**, Carter *El Rev Lond* \* July 8-92; Prony brake, horse power characteristics, Crane *El Wld* \* Mar 15, 22-90, do. *Pwr* Feb, June \* Nov \* Dec -88. See also ENGINES, brakes; RAILROADS, brakes



**Bramwell**, George W. W. *Inst C E* v 109 -92

**Branner**, John C., por. *E & Min* \* Dec 12-91

**Brass** foundry building, Nat. Meter Co., Brooklyn *E Rec* \* June 18 \* Sep 10-92; (locom. construction) *The Eng* Oct 21 \* Nov 4 \* Dec 30-92

**Brazil**, Ivins *Sc Am Sup* Jan 4-90

**Brewery**, Guinness' *Eng* \* Sep 14, 28, tramways, Georghegan \* Oct 12-88, do. St. James Gate *The Eng* Aug 24, tramways in, 31, 31-88, do. Dublin *Sc Am Sup* Dec 1-88

**Brewing**, Paris exhib. *Sc Am Sup* \* May 10-90, *Genie Civil*; Trades exhib. *The Eng* Nov 2-88

**Bribner**, Alan *Inst C E* v 101 -90

**Brick**, law of crushing strength, Baker *E News* Feb 2-89; brick-work, to estimate, n Oct 12-89; permeability, expts., Hale \* Jan 8, 10; nomenclature, com. report Mar 7-91. See also PAVEMENTS, brick

**MAKING** industry, manufacture about N. Y. city, Tomkins; near Chic., Purington; slate, Villalon; in Sinaloa, Mex., Avela, *Am C E* v 18 -88; and pavement, discuss., Calkins, insets (full) \* v 26 -92; Davis, bk. review *E & Min* Dec 21-89; oil vs. coal for burning, Crafts *E News* Feb 2-89; Hudson river *Sc Am Sup* Nov 8-90; machinery, Bale \* Feb 8-90, *Bld News*; do. Craven, stiff plastic *The Eng* \* July 25-90

**Brickenden**, James G. *Inst C E* v 92 -88

**Bridges**, *Eng* spec., Am., Pencoyd Iron Works, Dec 7, 21 -88

*E News* the world's great, and North river, proposed \* Jan 14; wts. of, formulas, Mossdrop, Mar 17-88; live loads and wts. of, Pegram, ed. \* Jan 10, 10; and trusses, skew pin connections, imp. in, Steiner \* Oct 17 \* Dec 26-91; soft steel in, Lewis, Nov 7-91, Jan 16, Mar 26-92

*E Rec* soft steel in, Lewis, Mar 12-26, Apr 2-92, do. Bischoff, Krohn, abs. *Inst C E* v 107 -92, *Zeit ost Ing* -91

*R Gaz* development of iron, Whipple \* Apr 19; eye-bars, wrt. iron and steel, tests, Gaylor \* May 10-89, *J Assoc Eng Socs*; long plate girder (115-ft.), econ., G. Thomson \* May 23 -90; details, Swensson, Feb 26; disputed points in designing, Waddell, cor. Sep 9, 23-92

*The Eng* staging for erection, June 8-88; highest viaducts in world (list), June 10-92. See also BRIDGES, draw-bridges, highway, railroad



**Bridges**, AARE, Coblenz, pneu. foundations *E News* \* Apr 9-92

ACCIDENTS, failures, Am., G. Thomson *Eng* \* Sep 14-88;

Apple river, fall *E News* Mar 31; Arcole Apr 14-88; wreck

of Browning's trestle, Vir. Midland, Thornton, cor. *R Gaz* \*

July 20; railroad bridge failures, G. Thomson, and ed. *R Gaz*

Sep 28, Oct 12-88; the Mœnchenstein, Basel, Switz. (full)

*E News* \* Aug 1, ed. 8, Dec 26-91, do. *R Gaz* \* July 17-91,

do. *The Eng* \* Dec 4, 11-91, Ende \* Feb 19-92. See also

RAILROADS, accidents

ALBANY, N. Y., Hawk st. viaduct *E News* \* Feb 16-89

ALOGAS Ry., Brazil *E News* \* July 25-91

AMERICAN, and English, Fidler *Eng* Nov 9, Dec 7, 21, 28-88,

new, ed. Oct 3-90; table, Berkley *Inst C E* v 107-92; French

engineer on, Le Rond *R & Eng Sep* -89, *An Ponts*

AQUEDUCT truss *E Rec* \* Mar 14-91

ARAUCO R and Bio-Bio, Manby *Inst C E* \* v 108-92

ARCHED, *Eng* pressures on voussoirs and abutments, Paterson,

cor. \* Dec 14, joints, pressures, Trautwine \* 21-88

*E News* stone, Springfield, Mass., proposed \* May 12, June

2, Herschel, July 28 ed. Aug 4 \* Nov 3; skew or spiral, Paret,

Cin. & Rich. R. \* Oct 20, 27, Nov 3-88, Johnstown ribbed arch,

Pa. \* July 20-89; Conemaugh, Penn. Cen. R. \* Mar 29; stone,

Elyria, O. \* June 21; ribbed steel, Rock Lane, New Haven,

Ct., Hill \* Aug 16-90; stone, Falls of Schuylkill, Phil. &

Reading R. \* Jan. 24; stone, Elkader, Ia., Turkey river \* Apr

11; Monier method of constructing, Berlin \* May 23; stone,

with lead joints at key \* Oct 24-91; New Brunswick, N. J.,

Albany st. masonry arch \* Apr 16; Gour Noir viaduct, Vegere

river, Uzerche, France, inset (full) \* Aug 18; Mt. Vernon via-

duct \* Sep 1-92

*E Rec* St. Paul, Col. st. skew arch \* Nov 23-89; Minneap.

steel \* May 10-90; stone park, Prov. \* July 23-92; skew

arch course traces, Haines *Inst C E* v 105-91; German con-

struction with hinged arches, Riviere, abs. v 107-92; *An*

*Ponts* June 91; Monocacy Creek stone, sidewalk, Beth., Pa.,

Grossart *Lehigh Eng J* Apr -89; Wheeling, W. Va., 158-ft.

*R Gaz* \* Aug 15-90. See also ARCHES

ARTHUR Kill draw-bridge, Staten Is. Rap. Tran. Co. *R Gaz* \*

June 22-88, \* July 26-89

ASSAM suspen., Doyong river *The Eng* \* Aug 15-90

AUSTRIA iron, renewal, Huss, abs. *Inst C E* v 98-89, \* *Zeit ost*  
*Ing*-89



- Bridges, BALTIMORE, Md., Cedar Ave. *R Gay* \* Sep 18-91**  
**BATTERSEA, England, inset *The Eng* \* July 25-90**  
**BEARINGS, fixed and expan., Sinot-Pichin R. *The Eng* Oct 12-88**  
**BEAVER river plate girder, Pitts. & L. Erie R., inset *E News* \* Apr 2-92**  
**BELAJA river, Samara-Ufa R., Russia, inset *Eng* \* July 11, 25-90**  
**BERLIN, the Moltke, Pinkenburg, iron tilt do., abs. *Inst C E v 92* -88, *Deut Baus* -87**  
**BERLIN Iron Co. plant, E. Berlin Ct. *E News* \* Oct 3-91**  
**BIG Warrior river, Memphis & Birm. R., Cordova, Ala. *R Gas* \* June 29-88**  
**BINGHAMPTON, N. Y., Court st., erection *E Rec* \* Mar 8-90**  
**BISMARCK, erection *E Rec* \* Nov 3-88**  
**BLACKFRIARS, Lond. Chat. & Dover R., Thames river, Cruttwell *Eng* May 7-90**  
**BOAT, Indian, Fenner *R & Eng* \* Sep -88**  
**BOSTON, Mass., Boylston st., over B. & A. R. *E News* \* May 25-89, do. er. *E Rec* \* June 8, 22; Harvard, er. \* 29-89; Bussey, Robbins *Tech Q* \* Sep -87**  
**BOWSTRING, inverted, Bosman St. R. *E News* \* Oct 6-92**  
**BROAD & James river, erection *E Rec* \* Feb 7-91**  
**BROCHOCKIS portable *Eng* \* Apr 5-89**  
**BROOKLINE, Mass., plate girder highway, inset *E News* \* Sep 19-91**  
**BROOKLYN and N. Y., (East River) suspension *Eng* traffic \* July 27-88, Oct 24-90**  
*E & Min* problem, Apr 28-88, (terminals) inc. of carrying capac., Wellington \* Apr 5-90, problem \* Jan 17-91  
*E News* growth of traffic \* Feb 11, enlarging capac., report of bd. of experts and eds., with inset map of residence areas \* Mar 17, 24, terminals, report Apr 21, adopted plans for, C. Martin, Wellington and eds. \* 28, do. discuss. *Brooklyn Eagle* 28-88, terminal plans *E News* \* Jan 11, Mason, cor. \* Mar 8, problem May 3-90, new terminals, report \* Jan 17, enlarging capac., ed., diag. and second report \* Feb 14, 14, 28, cor. \* Mar 7, cor. \* 21-91  
*E Rec* terminal facilities, com. rep. Jan 17-91, \* Sep 24, operation, diag. \* Dec 17-92  
*R Gas* terminals, proposed \* Dec 27-89, report, Dec 11-91, traffic, Cable Co., table, Oct 28-92



**Bridges, BROOKLYN**

*St R J* bd. of experts report \* Feb -91, report, Jan -92.

See also CABLE railroads, Brooklyn bridge

BUFFALO Trace, viaduct Ky. Midland R. *E News* May 25-89, erection *E Rec* \* Dec 14-89

BUENOS Ayres & Valparaiso Transandine, Jackson, inset *Inst C E* \* v 109 -92

BUILDING, combination on Pac. coast, Ottewell, insets *Am C E* \* Oct 27-92; construction, iron and steel, Fidler, bk., Griffin & Co., Lond. -87; history, Manners *Eng* \* Jan 1-28 \* Feb 5-26 \* Mar 4, 11-92, do. *E Rec* Jan 30, Feb 13-27, Mar 5, 26, Apr -92, do. *Sc Am Sup* \* Mar 12, 19 \* Apr 16, 23 \* May 7, 14, 28, Aug 6-92; in Am., T. Thomson, insets *E Mag* \* Oct -92; rivets, conventional code for, Ferris, cor. *E News* \* Jan 26-89; England and U. S., prices, Dec 15-92; erection, European methods *E Rec* \* Mar 1-90; development, Trowbridge *Sc Am Sup* Mar 17-88, *N Y Acad Sci*, do. Swain *Soc Arts Mass* -88

BULL Creek, Paola, Kan., Kan. C. Fort Scott & Memphis R. *E Rec* \* Mar 5-92

BUSSEY, Robbins *Tech Q* \* Sep -87

CAIRO, Ohio river, Ill. Cen. R., substructure, inset *E News* \*

Feb 7-91, *R & Eng* Dec -89, *R Gaz* June 1-88

CAPUTH ferry, Tay river *Eng* \* Sep 13-89

CASCADE, Sears, cor. *E News* Sep 1, Oct 6-88

CEREDO, Ohio river *E News* \* May 17-90

CERNAVODA, Danube river, Roumania, proposed *E News* \* Aug 23-90

CERVEYRETTE gorge, Briancon, France, inset *E News* \* June 9-92, *Sc Am Sup* \* May 21-92

CHATTANOOGA, Tenn., Walnut st., inset *E News* \* May 16-91

CHENAB, Indian State R. *The Eng* Sep 14-88

CHESAPEAKE & Ohio, Ohio river, Burr, inset *Eng* \* Dec 5-90

CHICAGO, Ogden Ave. viaduct, inset *E News* \* Feb 6-92; draw-br., Madison st., inset *R Gaz* \* Mar 11-92

CHICAGO, Bur. & Northern *E News* \* Apr 7 \* May 5, June 9-88

CHICAGO, Bur. & Q. R. standard double track *E Rec* \* Oct 6-88, \* Jan 26 \* Feb 9-89

CHICAGO, Mil. & St. P. R. pin bearing plate girder *E Rec* \* Nov 21-91



- Bridges**, CHICAGO & No. Western R. thin floor plate girder  
*E News* \* Apr 9-92
- CHICAGO & Western Indiana Belt R., 105-ft. double track through  
 span *R Gaz* \* Oct 30-91
- CHITTRAVATI river, Madras R., India, Stoney *E Rec* \* Apr 30 \*  
 Aug 6, 13 \* Nov 12-92, and discuss., insets *Inst C E* \* v 103,  
 104-91
- CINCINNATI & Covington elevated R. Transfer & Br. Co., river  
 spans of, Burr, insets (full) *Am C E* \* v 23 -90, (full) *Sc Am*  
*Sup* \* Dec 13-90
- CINCINNATI & Newport *E Rec* Sep 10, Nov 5 \* 19 \* Dec 31 etc.  
 -92
- CLARENCE, Taff river, Cardiff, So. Wales, inset *Eng* \* Jan 30 \*  
 Feb 13, inset \* Mar 6, inset \* 20, 20-91
- CLEVELAND central viaduct *E News* \* Dec 22-88
- CLYDE river, proposed *R & Eng* \* Mar -89, \* *Industries*
- COFFER-dam or caisson without timber or iron in its construction,  
 R. Harris, discuss., insets *Am C E* \* v 24 -91, *R & Eng* May  
 -91
- COLORADO river cantilever, Cal. & Ariz. R. *E News* \* Feb 23  
 -89
- COLUMBIAN exhib. steel canal *E News* \* Apr 21-92
- COLUMNS, z-iron, expts., Strobel *Am C E*, *R Gaz* July 13-88
- COMPRESSION members, Bess. steel, expts., Dagron, discuss., in-  
 sets *Am C E* \* v 20 -89
- CONEMAUGH arch, Penn. Cen. R. *E News* \* Mar 29-90
- COTEAU, St. Lawrence river, Quebec, Can. Atlan. R. *E News*  
 \* Apr 12-90, machinery for swing span, inset \* May 30, 30  
 -91, construction, Mountain, abs. *Inst C E* v 109 -92, *Can*  
*Eng* -91. See also BRIDGES, draw-bridges
- CRIB, Salisbury & Haney R., N. B. *E News* \* June 7-90
- CRUEIZE viaduct, Marjevois, So. France R., n *R & Eng* \* Mar  
 -91, \* *Genie Civil*, *The Eng* \* June 5-91
- CUMBERLAND, Md., Balt. st. *E News* \* July 21-92
- DALMARNOCK, Glasgow, inset *Eng* \* Mar 28-90
- DELAWARE, Lack. & W., White's plate girder *R & Eng* \* July  
 -91
- DRAW-BRIDGES, swing, turning by elec. power *El Rev* \*  
 Apr 20-89; hydr. machinery, Fidler *Eng* Feb 19-92; end-  
 adjusting gear for, Turner *E News* \* Apr 16, vertical lift,  
 method of operating \* June 30-92; lock, Penn. R. *R Gaz* \*



**Bridges, DRAW-BRIDGES**

July 27-88; protection, Boston, Rev. B. & L. R., Hammond,  
Oct 14-92

ARTHUR Kill, Staten Is. Rap. Tran. Co. *R Gaz* \* June 22-88,  
approaches \* July 26-89

BERLIN, Moltke iron tilt, Pinkenburg, abs. *Inst C E* v 92 -88

BRIDGEPORT, Ct., elec. operation *El Wld* \* Apr 20-89

CASTLETOWN swing, Wawn, inset *Inst C E* \* v 92 -88

CHICAGO river folding, *Eng* \* July 24-91; swing by electricity  
*R Gaz* \* Aug 21-91; Madison st., inset \* Mar 11-92;

Weed st., folding floor *E News* \* May 23-91

COTEAU, St. Lawrence river, Quebec, Can. Atlan. R., machinery  
for swing span, inset *E News* \* May 30, 30-91. See also  
BRIDGES, Coteau

DEE river swing, Manchester, Shef. & Lincoln R. *The Eng* \*  
Nov 22, 29-89

DISMAL swamp canal, Norfolk & W. R., inset *E News* \* Nov  
3-92

DRYPOOL swing, Hull *The Eng* \* Jan 3-90

DULUTH, Minn., ship canal, designs *E News* \* Oct 27-92;  
lift, proposed, inset *R Gaz* \* Apr 8-92

FLORENCE R., Tenn. river *E Rec* \* Feb 28-91

FRASER river Howe truss, Can. Pac. R., Cambie *R Gaz* \* Nov  
25-92

GLAMORGANSHIRE canal swing, Cardiff *The Eng* \* Aug 7-91

HACKENSACK, Erie R. *R Gaz* \* July 20-88

HARLEM river lift, *R Gaz* June 10, temporary pile supports,  
Triest \* Aug 19-92

KIDDERPORE docks swing *The Eng* \* Apr 22-92

MANCHESTER ship canal swing *Eng* June 6-90

NANTICOKE river R., erection *E Rec* \* May 18, 23-91

NEW London, Ct., Thames river *E News* \* Aug 16-90

OAKLAND, Cal., accident *E News* \* June 7-90

PAUMUNKEY river, erection *E Rec* \* Feb 14-91

PETALUMA *E News* \* Oct 13-88

POLLET swing, Dieppe, France *R Gaz* \* Aug 26 \* Sep 9-92,  
inset (full) *The Eng* \* July 29 \* Aug 5-19 \* Sep 9-92

TARENTO, Italy *E News* \* Sep 13-90

THAMES river, New London, Ct., pivot pier *R Gaz* \* Nov 7-90

TIENTSIN, China R. *The Eng* Feb 3, 24-88

WINONA, Minn., swing span, inset *E News* \* Oct 17-91



- Bridges**, DUFFERIN, Ganges river, Benares, Oude & Roh. R., India *Eng* \* Feb 17, 17-**88**, Walton, Mar 7-**90**; construction, Walton *E Rec* Aug 22 \* Dec 19-**91**, Jan 9, 30-**92**; Walton, discuss., insets *Inst C E* \* v 101 -**90**, do. *The Eng* Mar 14-**90**
- DULUTH, Minn., 6th ave. viaduct *E Rec* \* Feb 20, 27, harbor entrance, proposed May 14-**92**. See also BRIDGES, draw-bridges, Duluth
- DU VIAUR viaduct, proposed, inset *E News* \* Nov 30, 30-**89**
- EARN viaduct, Caled. R., Scot., renewal, inset *Eng* \* Sep 16-**92**
- ENGLISH Channel, proposed, Schneider *Eng* Sep 27-**89**, ed., Aug 7-**91**, \* Sep 23-**92**; Talansier *E Rec* \* Nov 2, 16-**89**, \* *Genie Civil*; *F Inst* Nov -**89**; *R & Eng* \* Nov -**89**; *R Gas* Oct 11-**89**; *Fleury Rev des Deux Mondes* Aug 15-**92**; Schneider, Hersent, prelim. designs (very full) *Sc Am Sup* \* Nov 2, 9, 16 \* Dec 21, 28-**89** \* Jan 25-**90**, do. *The Eng* \* Sep 27 \* Oct 4, 11-**89**
- ENZ river, Hofen *Eng* \* May 6-**92**
- FLOATING, Portsmouth & Gosport, Harris *Eng* \* Oct 7 *E Rec* Oct 15, *Sc Am Sup* \* Nov 19, *The Eng* \* Sep 23-**92**, *Inst M E*
- FLOORS, wrt. iron double track floor-beam, Boller, discuss., insets *Am C E* \* v 18 -**88**; do. *Sc Am Sup* \* June 2-**88**; do. *The Eng* Apr 27-**88**; floor-beams and pine stringers for, Bates, dis., insets *Am C E* \* v 23 -**90**; Hobson's flooring *Eng* \* Nov 29-**89**; iron and ballast floor *E News* \* Mar 23-**89** \* Oct 27-**92**; solid R. *R Gas* June 27, ed. Oct 31-**90**, shallow \* Sep 11 -**91**. See also BRIDGES, railroad, floors
- FOOT-bridges, Oker river, Brunswick, inset *Eng* \* Aug 17, inset \* Sep 7-**88**; Ouse river, Bedford *Sc Am Sup* \* Sep 8-**88**; Kernot, cor. *The Eng* Aug 16 \* Nov 15-**89**
- FORTH, *Am C E* obs. on, Emery, insets \* v 22 -**90**  
*Eng* inset, \* Apr 27, May 11, inset, 25, July 6, Aug 10, Cooper 31, Biggart, Dec 14-**88**, compared with Eiffel tower, May 3, inset, Nov 15, inset, 29, Dec 6-**89**, history, Westhofen (very full des.), insets \* Feb 28, ed. Mar 7, assessable valuation, Oct 3-**90**  
*E Mag* greatest in world, Clarke \* Apr -**91**  
*E & Min* \* Mar 15-**90**, \* *Industries*  
*E News* \* Mar 10, Cooper \* Sept 22-**88**, \* Feb 9, determination of wind pressure by model, n Mar 16-**89**, inset \* Jan 25, 25, testing, Feb 15, notes, Mar 15, final inspection report, Mar 29-**90**, criticisms, Cooper, cor. Lindenthal, Dec 5-**91**



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*E Rec Baker* \* Oct 12-89; construction \* Sep 6-90 \* Jan 10-91

*Inst C E* hydr. appliances at works, Moir, inset \* v 91 -88, Austrian prototype of Köstlin, abs. n v 92; Queen's ferry, Nott *Locom* June -90

*R & Eng* description \* Feb -90

*R Gaz* Biggart \* May 18, erection \* July 13, discuss. on bridge steel, Cooper, Sept 14-88, *Iron & Steel Inst Brit.* \* Nov 15-89, *Industries* Oct 11-89, wind pressure obs. *R Gaz* Apr 18-90

*Sc Am Sup* Cooper \* Oct 13 \* Nov 17-88, Jan 19-89

*The Eng* Feb 3, Aug 24, Oct 19, 19, Nov 9, 9-88, \* Jan 11, July 26 \* Aug 2, 23, 23, inset \* Dec 13-89, \* Feb 28, opening, Mar 7, Ry 14-90

FORT Madison, Miss. river, inset *Eng* \* July 19-89, *Sc Am Sup* \* Aug 31-89

FORT Smith R., Ark., piers *E Rec* \* Oct 22-92

FOUNDATIONS, design, H. Lewis *E News* Oct 17-91; repairing, Wash. aqueduct, D. Hunt *E Rec* \* Dec 27-90; piling vs. mud-sills, Cantine *R Gaz* Sep 9-92. See also FOUNDATIONS

GAGNIERES viaduct *R & Eng* \* May -89

GARABIT viaduct *E Rec* \* Mar 7-91; Eiffel, abs. *Inst C E* v 95 -89, *Compt r* July -88

GIRDER, fundamental types of metallic and the cantilever system, Gaudard, abs. *Inst C E* v 106 -91, *An Ponts* Mar -91; girder tests, Austrian, mild steel *R Gaz* \* Nov 27-91; girder flanges, lateral stability of *The Eng* \* May 29-91. See also BEAMS and girders

GLAMORGANSHIRE canal swing, Cardiff *The Eng* \* Aug 7-91

GLASGOW harbor high level, proposed *Eng* Jan 11-89; Glasgow Cen. R., inset \* Aug 19-92. See also BRIDGES, highway, Glasgow; Railroads, underground, Glasgow Cen.

GLENURY viaduct timber arch *E Rec* \* Nov 12-92, *Eng*

GREENOCK & Gourock R., inset *Eng* \* Feb 22-89

GROUSE valley R. *E Rec* \* Jan 19-89

GOUR Noir viaduct, Vegere river, Uzerche, France, inset (full) *E News* \* Aug 18-92

HACKENSACK draw-bridge, Erie R. *R Gaz* \* July 20-88

HARLEM river, N. Y. *E News* \* May 20-92; *E Rec* \* Jan 21, erection \* July 7-28 \* Aug 11, Sep 1-88; lift *R Gaz* June 10,



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temporary draw-br. pile supports, Triest \* Aug 19-92. See also BRIDGES, draw-bridges, Manhattan

HAWARDEN, Dee river, Fox *E News* \* Sep 15-92, inset *Inst C E* \* v 108 -92

HAWKESBURY R., New So. Wales, Burge *Eng* Mar 7-90; motions, observed in, Ewald, cor. \* Feb 6-91, do. *E News* \* Mar 14-91; Jan 5, testing, July 20-89; erection *E Rec* \* May 30 \* June 6-91; Burge, insets *Inst C E* \* v 101 -90; placing the center span *R Gaz* \* Aug 10-88; *Sc Am Sup* \* Aug 11-88; *The Eng* Sep 7-88, June 14, Sep 18-89, Burge Mar 7-90

HIGHWAY, Cincin. cantilever, Kaufman, insets (very full) *Am C E* \* v 27 -92; Glasgow road, Grt. West. R., inset *Eng* \* Aug 22-90

*E News* Waterford, N. Y. \* June 1; iron viaducts for, Waddell, 8; \* July 6-89; supervision, proposed system, Stowell, Mar 22, 29; legislation, proposed, Breithaupt, cor. Apr 19; designs, Owen, cor. May 10; the bridge of the future, Dibbles \* June 21; Guilderland, N. Y. (unsafe), Stowell, cor. \* Aug 30; wire suspen., Victor, Cal., etc. \* Nov 8-90; plate girder, Brookline, Mass., inset \* Sep 19-91; Rockford, Ill., State st. plate girder, inset \* Feb 27; Stearns truss for \* July 21-92

*E Rec* viaducts across R. tracks, Gayler, Sep 19-91, do. *J Assoc Eng Socs*, iron and steel, Waddell, discuss. Nov -88, abs. *Inst C E* v 95 -89; floors of st., Gayler, abs. v 98-88, *J Assoc Eng Socs* -88; Kelvin river road, Glasgow *R & Eng* \* Nov -91; Niemen river, Olita, Russia \* Dec -92; 158th st., over N. Y. Cen. R. *R Gaz* \* Nov 9-88; Nova Scotia \* May 3-89; over R. tracks, experience with, Gayler, Aug 21 -91; brick, Persia *Sc Am Sup* \* Dec 31-92

HOUGHLEY river Jubilee R., India, Leslie *Eng* Jan 27-88, erection *E Rec* \* Oct 4, 25-90, do. discuss., inset (full) *Inst C E* \* v 92-88, do. *The Eng* Feb 10-88

HOWE truss, timber, Willamette river, Albany, Or. *Eng* \* Jan 6-88; timber structures, western Am. 180 and 250-ft. span, inset \* Oct 7-92; determination of length of strut, D'Armit, cor. *E News* \* Nov 16, 23, strut prob. Dec 14-89; Or. Pac. R., strain sheets, inset \* Apr 26, 28; 50 and 68-ft. spans, Can. Pac. R. \* May 24-90; R., Jameson *R & Eng* \* Mar \* May \* June \* Aug \* Sep \* Oct \* Dec -90 \* Jan \* Feb -91; Willamette



**Bridges, Howe**

river, timber, Albany, Or. *R Gaz* \* Apr 19-**89**, *Sc Am Sup* \* Mar 17-**88**, *Eng*

HUDSON river, first design, Pope's flying lever, 1811 *R & Eng* \* May -**88**; tunnel, ed. *E News* May 31-**90**

INDIA, bridging alluvial Punjaub rivers, ed. *Eng* Jan 31, notes, Feb 14, Mar 28-**90**; Chittravati, discuss., insets (full) *Inst C E* \* v 103, 104 -**91**. See also BRIDGES, Chittravati — Hooghley river — Sukkur

IRON, wts. of, formulas, Beatty *Lehigh Eng J* June -**88**

JERSEY City, Harsum's Cove transfer, Benset, insets *Am C E* \* v 19 -**88**

KANAWHA river *E Rec* \* Aug 17, 31 \* Sep 14, 28 \* Oct 5, 19, 26 -**89**

KENNEWICK, No. Pac. R. *R Gaz* \* Nov 8-**89**

KENTUCKY river, or Tyrone cantilever, inset *E News* \* Apr 5-**90**; Irvine, Ky., erecting \* May 26-**92**

KENTUCKY & Indiana, Louisville *Eng* \* Jan 27-**88**; Moulton, abs. *Inst C E* v 92 -**88**, *Am C E* Sep -**87**

KINGPOST truss, wrt. iron shoe for, Cin. N. Or. & Tex. R. *E News* \* Apr 6-**89**

KINZUA viaduct, J. Clarke *Am M E* \* v 11-**90**; 1882, T. Clarke *E News* July 5, n, Aug 30-**90**

LAGAN, Belfast *The Eng* \* Aug 22, 29, 29-**90**

LANDSLOWNE, at Sukkur, Indus river. See BRIDGES, Sukkur

LOA viaduct, Antofagasta R., Bolivia 336 ft., highest in world *E News* \* May 18-**89**, *R & Eng* \* June -**89**, *Sc Am Sup* \* Mar 15-**90**, *The Eng* \* Apr 19, 19, inset \* 26-**89**

LONDON, England, Blackfriars, Thames river, Lond. Chat. & Dover R., Cruttwell, discuss., inset *Inst C E* \* v 101 -**90**, *The Eng* Mar 21-**90**

THAMES river, proposed *E Rec* \* Nov 19-**92**, do. Ratcliffe to Rotherhithe, and ed. *The Eng* \* Oct 28, 28-**92**

TOWER. See BRIDGES, Tower, London

LONG span, discussion of, Lindenthal *E News* \* Mar 3, 10, 24; very long span, proposed design, Warren \* June 30-**88**; and North river, N. Y., Lindenthal, Nov 9, 16, 23-**89**; table *R Gaz* May 2-**90**

LYONS, Rhone river, Nansouty, abs. *Inst C E* v 106 -**91**, \* *Genie Civil* v 19 -**91**; great, Fournere & Croix, Rousse. *Sc Am Sup* \* Oct 24-**91**



- Bridges, MALLECO** viaduct, Chili, Mamy, abs., inset *Inst C E* \* v 104-**91** *Genie Civil* \* v 18 -**91**
- MANARVATER timber viaduct, New Zealand *E Rec* \* Jan 4-**90**
- MANHATTAN, Harlem river, N. Y. *Eng* \* May 4-**88**, *E News* \* Feb 4, Sep 8-**88**. See also BRIDGES, Wash.
- MARBLE Creek viaduct *E Rec* \* Apr 18-**91**
- MARENT Gulch high viaduct, No. Pac. R. *R Gaz* \* Apr 26-**89**
- MARGHERITA, Rome *R & Eng* \* June -**92**, *Industries*; Turin, Po river, abs. *Inst C E* v 92 -**88**, *Giornale Civ* -**87**
- MASONRY, with semi-free joints, Cunningham *Eng* \* May 6, *Sc Am Sup* \* June 25-**92**, *An Ponts*
- MATTABESSETT river, E. Berlin, Ct., inset *E News* \* Apr 2-**92**
- MAUCH Chunk suspension, Hildebrand *E News* \* Feb 25, Mar 10-**88**
- MEMPHIS R., Miss. river, Tenn. *E News* \* May 12, inset \* June 16, inset \* Sep 15-**92**; erection *E Rec* June 20 \* July 25 \* Oct 17-31 \* Nov 7-**91** \* May 14-**92**; and ed. *R Gaz* \* Feb 21 -**90**, June 26-**91** \* May 13-**92**; *The Eng* Aug 3-**88**
- MICHIGAN Cen. standard. with 3 inside guard rails *R Gaz* \* Nov 1-**89**
- MISSOURI Pacific, inset *E News* Feb 14-**91**
- MOLDAU viaduct, at Cervena *E News* \* Apr 19-**90**; Huss, abs., *Inst C E* v 98 -**89** \* *Woch ost Ing* -**89**
- MONTREAL, proposed *E News* May 31-**90**
- MORAND, Rhone river, Lyons *The Eng* \* Oct 16, 23, 30-**91**
- NEEDLES, cantilever, Col. river, Cal., Atlan. & Pac. R., inset *R Gaz* \* Apr 25-**90**
- NEWARK Dyke, Grt. Northern R. *The Eng* \* Mar 7, 21-**90**
- NEW Brunswick, N.J., Albany st. masonry arch *E News* \* Apr 16-**92**
- NEW London, Ct., Thames river. See BRIDGES, Thames river
- NEW Orleans, Miss. river, projects *R Gaz* \* May 16 \* July 11-**90**
- NEWPORT viaduct, Isle of Wight, inset *Eng* \* Jan 25-**89**
- NEW York Cen. double track with solid plate floor *R Gaz* \* May 17-**89**
- NEW York and N. J., Clark report, inset *R Gaz* \* Sep 23 *Sc Am Sup* Oct 22-**92**. See also BRIDGES, Harlem, Manhattan.
- North river, railroad, Washington, etc.
- NEW York, Prov. & Boston ballast floors *E News* \* Mar 1-**90**
- NEW York Rapid Transit R. viaduct, proposed *E News* \* Oct 31-**91**



**Bridges**, New York Terminal R., Hudson river, proposed *E Rec* \* Jan 14-88

NIAGARA suspen., towers reconstruction, Buck, *Am C E* v 17 -87, abs. *Inst C E* v 93 -88

NORFOLK & Carolina transfer, inset *E News* \* Jan 30-92

NORFOLK & Western standard plans *E News* \* June 23, 28-88

NORTH river suspen., N. Y., proposed, Macqueen *Cosmop* Aug -92; Lindenthal *Eng* \* May 9-90; and world's great *E News* \* Jan 14, 14, discuss. of long span bridges, Lindenthal \* 28, 28, Feb 4-88; July 20-89; Lind. reply *E Rec* July 20-89; *Sc Am Sup* \* Nov 7-91, *R Rev*; Lindenthal's project, criticism, Ende *The Eng* \* May 17, Lind. Aug 30-89

OAKLEY skew, Cin. & Rich. R., design and erection Crowell, insets *Am C E* \* v 23 -90

OHIO, Cin. & Covington Elevated R., Burr, *Am C E* v 23-90, abs. *Inst C E* v 103 -91

OHIO Connecting R., Pitts. Pa., floating 523-ft spans into place, inset *E News* \* Sep 20, false works \* 27-90, do. (full) *E Rec* \* Sep 13, erection \* Dec 13-27-90 \* Jan 3-91, Strobel, abs. *Inst C E* v 103 -91; inset *R Gaz* \* June 20, Aug 22, inset \* Sep 12-90

OHIO river, completion of, *E News* Jan 12-89

OMAHA, erection *E Rec* \* Mar 9, 16-89; suit *R Gaz* July 31-91

ORISKANY, N.Y., Cen. & Hud. R. R., inset *E News* \* Dec 7-89

OSCHUTZ viaduct *R & Eng* \* May -88

PADERNO viaduct, Adda river, Sacheri, abs. *Inst C E* v 98 -89 \* *L'Ingeg Civile* -89, *R Gaz* \* Sep 14-88

PALATINE, Tiber river, Rome *R & Eng* \* Mar -92

PARALLEL-chord, tables for finding stresses in, Hitchcock, inset *E News* May 23-91

PASSENGER ferry, N.Y. L. Erie & W. R. *E News* \* Apr 6, cor. 20-89

PATIALA-Bhatinda R., iron-work *The Eng* Nov 16-88

PECOS river, Southern Pac. R., Tex. *E News* \* Feb 6-92

PENCOYD shop *E Rec* \* July 27 \* Aug 3-89

PENN. R. frt. car transfer, Jersey City, inset *E News* \* Jan 18, 18 -90; draw-bridge lock *R Gaz* \* July 27-88

PHILADELPHIA, Market st. cantilever, Amweg *E News* Apr 7-88

PIERS, Red river concrete, Purdon *E News* \* June 2-88; French masonry and detail \* Sep 5-91; Stettin, Ger., masonry removal \* July 14; screw piles for \* Aug 4-92; moments, graph.



**Bridges, PIERS**

- method of obtaining, Lindenberger *F Inst* \* Nov -89; and river crossings, Otagawa *R & Eng* \* Nov \* Dec -88, Jan -89; repairing under water, Rossignol \* Sep -90, *An Ponts*
- PILE and trestle, Robinson *E News* Apr 7-88. See also BRIDGES, railroad; PILING; TRESTLES
- PINS, fibre strain in, J. Johnson *E News* \* Jan 28, Du Bois, cor. Mar 10, strains in, Fowler, cor. \* 24; and eye-bars, proportions, Stowell, Mar 31-88
- Po river, at Casalmaggiore, Parma-Brescia R., erection *E Rec* \* May 5-26-88, abs. *Inst C E* v 95 -89, *L'Ingeg Civil* -88
- POLLET swing. See BRIDGES, draw-bridges
- PONTOON. Indian boat, Fenner *R & Eng* \* Sep -88
- PONY lattice, N.Y., West Shore & B. R. *R Gaz* \* Sep 21-88
- PORTABLE, Brochocki's *Eng* \* Apr 5; Paris exhib. \* Aug 2-89; *E News* May 26 \* Sep 1-92; French iron, Talansier *E Rec* \* Jan 12-89 \* *Genie Civil*; metallic, for quick erection, Pichault, abs. *Inst C E* v 91 -88, *Assoc Ings Liege* -87
- PORTAL bracing, anal. of stresses, Cain *E News* July 13-89
- PORTSMOUTH & Gosport floating, Harris *Eng* \* Oct 7, *E Rec* Oct 15, *Sc Am Sup* \* Nov 19, *The Eng* \* Sep 23-92, *Inst M E*
- POUGHKEEPSIE, cantilever, Hudson river, construction, O'Rourke. insets (full) *Am C E* \* v 18 -88, inset *E & Min* Feb 2-89, *E News* Jan 7-88 \* Feb 16-89, abs. *Inst C E* v 96 -89, T. Clarke *Sc Am Sup* \* May 19-88, *The Eng* Sep 21-88
- PROVIDENCE, R.I., Point st., guard gates. Bullock, insets *Am C E* \* v 20-89, *E Rec* \* Nov 28-91
- QUERETARO aqueduct, Mexico *E News* \* June 2-88
- QUINDARO, caissons and cribs, inset *E News* \* Apr 4-91
- RADIAL truss, F. Smith, cor. *E News* \* Apr 11-91
- RAILROAD, wts. of, Du Bois. inset, new form of strut. Strobel *Am C E* \* v 18-88; Am., Cooper, discuss., insets (very full) \* v 21, 21 -89; R. bed for bridge structures. Woolson *Am M E* \* v 9 -88; bridging canons lengthwise. Hinckley, inset \* v 26-92; Burge, Walton, Cruthwell *Eng* Mar 7-90; Am. viaducts. Greiner \* Aug 14-91; Glenury viaduct renewing in Scot.. Caled. R., inset \* Sep 2, Earn viaduct \* 16-92; Am., Cooper. (full) *E & Min* \* Oct 5-26 \* Nov 2, 9, 30-89, do. *E News* \* July 6-89; Am., origin and evolution, Greiner \* June 6-91; use of steel for. symposium. Mar 26. Apr 2. Aug 25-92; wrt.



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iron floor beam, test, Boller *E Rec* \* Dec 10-87; new form of strut, Strobel, abs. *Inst C E* v 95-89; Dufferin, Hawkesbury, discuss., insets (full) \* v 101-90; Am., origin and evolution, Greiner *R Gaz* \* June 5-91; recent construction of, Ritchie *Sc Am Sup* Jan 17-91, *J Assoc Eng Socs*; spacing cross-girders in, MacKensie *The Eng* \* Mar 6-91; Moenchenstein failure, Switz., Ende \* Feb 19-92. See also under BRIDGES, Howe truss, and names of places and railroads, Forth—Loa—London, Blackfriars—Oakley, etc.; PILING; TRETTLES

DESIGNING, disputed points in, Waddell, discuss., insets (very full) *Am C E* \* v 26-92, *E News* Dec 12, 26-91, *E Rec* Dec 12, 26-91, Jan 9-92, *R Gaz* Oct 14, 28, Nov 4, 25-92

GUARDS, inside and outside, Dailey *E News* \* Jan 28, 28-88; rerailing, Buf. Roch. & Pitts. \* Sep 13; guard rails, McNicol, cor., ed. \* Oct 4, 4-90; St. R., Holland \* Mar 7; Cleveland rerailing guard \* Apr 11-91; Dutch St. R., Post *R & Eng* \* Apr; the Tilden \* Sep -91; Sav. Fla. & W. standard *R Gaz* \* Jan 17; and rerailer, Plant system \* 31-90; location of guard rail \* Feb 6-91

LEGISLATION *E Rec* Jan 10, 23-92

LOAD diag. for stresses in asimont *E News* \* Mar 10-88; panel concentrations due to engine loads, Szlapka, cor. Dec 6-90

RERAILER, Locke's protector *E News* \* Dec 27-90; Cleveland rerailing guard \* Apr 11-91; Post's *R Gaz* \* Mar 13-91. See also BRIDGES, railroad, guards

STRAINS, produced by loaded cars of 90,000 lbs. capacity, Blakely cor. and ed. *E News* May 10-90. See also BRIDGES, strains and stresses

TIMBER structures, western Am. *Eng* \* Sep 23, Howe truss 180 and 250-ft. span, inset \* Oct 7-92

RAO Shri Pragmalji, Mandvi, Kutch, Sykes *Inst C E* v 103-91

RED river concrete piers, Purdon *E News* \* June 2-88

RED Rock cantilever, Col. river, At. & Pac. R., foundations *E News* \* Sep 27; Waddell, inset detail sheet \* Oct 4, 4, correction, 11-90; Rowe *E Rec* Dec 19, 26-91, erection \* May 7 \* July 2-92, *Am C E*; abs. *Inst C E* v 103-91

RIPARIA, Snake river. Wash. T. *Eng* \* Nov 6, *Sc Am Sup* \* Dec 19-91



- Bridges**, RIVERMONT, Lynchburg, Va. *E News* \* Feb 21-91  
 ROCHESTER, N.Y., Driving Park ave., Genesee river *E Rec* \*  
 July 18 \* Aug 1, *R Gaz* \* July 17-91  
 ROCKFORD, Ill., State st. plate girder highway, inset *E News* \*  
 Feb 27-92  
 ROPE and military applics., Gisclard *Sc Am Sup* \* Oct 17-91,  
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 RULO, report, Morison, bk. review *R & Eng* Feb -91  
 ST. Guistina viaduct, So. Tyrol, inset *E News* \* Feb 1, 1-90  
 ST. JOHN cantilever *E Rec* \* Mar 16, 30-89  
 ST. LAWRENCE river, Lachine, Can. Pac R., inset *Eng* \* Apr 13  
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 ST. Louis, Mo., Merchant's, Miss. river, inset *Eng* \* May 15,  
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 -89; Grand ave., inset \* July 18-91; Maline Creek \* Feb 20  
 -92; Grand ave (suspension) *E Rec* \* June 6, 20, 27 \* July 4 \*  
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 ST. Mary's Falls, Sault Ste. Marie, wind strains on, diags. *E*  
*News* \* May 25-89; Massy \* Oct 18-90; canal and dam *E*  
*Rec* \* Mar 22-90  
 ST. Paul, Minn., Miss. river high br. *E Rec* \* Feb 16, 23, Mar 2  
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 arch \* Nov 23-89; Wabasha st., erection \* Dec 26-91 \* Jan  
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 ST. Peters, Dadore river *E Rec* Aug 10-89  
 SIBLEY, Missouri river, Chic. S. F. & Cal. R., Chanute, discuss.,  
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 88, abs. *Inst C E* v 99 -90, (dates) n *R Gaz* Feb 17-88  
 SIEE Ho, China R. *The Eng* Feb 3-88  
 SIOUX City, Monson report, pph. *R & Eng* \* May -91, *R Gaz*  
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 SKEW portals *E News* Apr 27, Leschorn, cor. \* May 18-89  
 SKIPTON & Ilkley, England *The Eng* June 15, 15-88  
 SOULEUVRE viaduct, France, Vire, St. Lo. & Caen R., piers  
*E News* \* June 28-90, *E Rec* \* Jan 10. 17-91, *Genie Civil*.  
*R & Eng* \* Mar. *Sc Am Sup* \* Apr 5. *The Eng* \* Jan 24-90  
 SMITHVILLE, Mo., Chic. Kan. C. & Tex. R., inset *E News* \* Jan  
 24-91  
 STAGING for girders bridges *The Eng* June 1-88  
 STARRUCCA viaduct, N.Y. L. Erie & W. R. *E News* \* Sep 1-88



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*R Gaz* Jan 6-88, *Am C E* -87

STEUENVILLE, P. C. & St. L. R., temporary support, renewing  
pier *E News* \* July 12-90

STOCKTON-on-Tees, Victoria br., Neate *E News* \* Sep 8-92,  
*Inst C E*

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STRAINS and stresses, Booth *Am C E* v 20 -89; greatest truss  
stress and position of load, etc., Eddy, inset (very full) \* v 22  
-90; slide moment diag. for computing, Greiner *E News* Apr  
14; web stresses with curved chords, Lindemberger, cor. \* 21  
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Baldwin, diag. \* Sep 28 \* Oct 12-89; device for cal. strains,  
Howe, Jan 11; mechan. comput. of stresses, Fletcher \* Mar 1,  
May 10, do. Webb, cor. \* Apr 12; strains produced by loaded  
cars of 90,000 lbs. capacity, Blakely, cor. and ed. May 10;  
method of cal. strains in Whipple truss, W. Baldwin (math.) \*  
Aug 30-90; computing strains, German practice, Waddell  
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tures, Hiroi *R & Eng* \* Oct -88

STREET'S Run viaduct. Pitts. Vir. & Charleston R. *E Rec* \* Mar  
26-92

SUBAQUEOUS viaduct *E News* \* Feb 28-91

SUKKUR cantilever, Indus river, Parsey, inset *Eng* \* Mar 9, 9-88,  
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downe, Robertson, insets *Inst C E* \* v 103-91, do. *The Eng*  
\* Jan 9-91

SUSPENSION, and flume for lumber transport, Cal. *E News* \* Apr  
11-91; proposed new system, Steiner, cor. \* Mar 12-92.  
See also under Bridges, names.

SUSQUEHANNA river. Phil., Harrisb. & Pitts. R. *R Gaz* \* Feb 12  
-91

SWISS No. Eastern standard plate girder *E News* \* Mar 26-92,

TARANTE, Italy, n *Sc Am Sup* \* Jan 14-88

TAVISTOCK & Shillamill viaducts, Plymouth & S. W. Junction  
R., England *The Eng* \* June 6-90

TAY viaduct, Dundee, Barlow *Eng* May 18-88, discuss., insets  
*Inst C E* \* v 94 -88, construction, Inglis *R Gaz* June 29-88

TESTING, Nansouty, Cuenot, abs. *Inst C E* v 108 -92, *Genie*  
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- Bridges**, THAMES river, New London, Ct., N. Y. Prov. & Boston R., inset *Eng* \* Apr 10 \* May 8, 15-91; *E News* May 19-88; *E Rec* \* Oct 11, 18-90; *R & Eng* \* June -88, Nov -89, report, Nov -90; draw-br. pivot pier *R Gaz* \* Nov 7-90; lower single span, opening, proposed *The Eng* \* Mar 18-92. See also BRIDGES, draw-bridges
- TIDE-water Pipe Co. suspn., Mauch Chunk, Pa. *E News* \* Feb 25-88
- TIMBER rolling-br., in Drowtheim, Cauer, abs. *Inst C E* v 92 -88, *Zeit Bauwesen* -87
- TORKHAM, India, launching of, Ollenbach *The Eng* Jan 13-88, *Ind Engr*
- TOWER, London, inset *Eng* \* Sep 23-92; *E News* \* July 6-89; *E Rec* May 21-92, *R & Eng* \* Oct -90 \* Oct -92, \* *Industries*; *The Eng* \* Aug 16, 30, Sep 6, 6 \* Oct 18, 18 \* Nov 8, 8, 15 \* Dec 20, 20-89 \* Apr 17-91
- TRANSANDINE, inset *Eng* \* Dec 2-92
- TRANSFER, Harsimn's Cove, Jersey City, Bensel, discuss., insets *Am C E* \* v 19 -88
- TRESTLES. See TRESTLES.
- TRUSSES, formulas for wt. of, Du Bois *Am C E* \* v 18-88; abs. do. *Inst C E* v 96-89; failures in 1889 and for 11 years, ed. *E News* Apr 19, 19; arch, Gilman, Aug 16-90; truss deflection, J. Johnson *R Gaz* Aug 1-90
- TURIN, Po river, Margherita, abs. *Inst C E* v 92 -88, *Giornale Civ* -87
- Two Medicine, Great No. R., St. Paul, Minn. & Manitoba R. *E News* \* Mar 19-92
- TWYFORD viaduct, Didcot, Newbury & Southampton R. *The Eng* \* Dec 18, 25-91
- VAN Buren, Ark. river, construction, Purdon, discuss., insets (full) *Am C E* \* v 20 -89, piers erection, do *E Rec* \* Jan 11-90
- VANDEVANDA, Penn. R. *E News* \* Jan 12-89
- VERRUGAS viaduct, Oroya R., Peru, inset *Eng* \* Apr 17; Olcott *E & Min* \* Jan 24-91; *E News* \* July 27-89 \* May 9-91
- VIAUR, Du., viaduct Carmaux & Rodez R., proposed, inset *E News* \* Nov 30. 30 *R & Eng* \* Nov, *Genie Civil*; *The Eng* \* Dec 27-89
- VICTORIA, Stockton-on-Tees, Neate, inset *Inst C E* \* v 100 -92; Kilmarnock *The Eng* Aug 30-89
- VIENNA, Stephanie, Danube canal, abs. *Inst C E* \* v 92 -88, *All Bauz* -87



**Bridges**, WASHINGTON, Harlem river, 181st st., N. Y. city, W. Hutton (bk.) *E & Min* \* Sep 27-90; designs, inset *E News* \* Dec 27-90; (Manhattan bridge) Hutton, bk. n *E Rec* Jan 31-91

WEEHAWKEN viaduct and pass. elevators, T. Brown, Blakeley, insets *Am C E* \* v 27-92, inset *R Gaz* \* Jan 22-92

WEIGHTS of, DuBois, inset *Am C E* \* v 18-88; formulas, Moss-crop *E News* Mar 17-88

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WILLAMETTE river Howe truss timber, Albany, Or., Or. R. & Nav. Co. *R Gaz* \* Apr 19-89, *Sc Am Sup* \* Mar 17-88, *Eng*

WINNER, Kansas City, Mo., details, inset *E News* \* Mar 15, inset \* July 19, 19-90

**Bridging** canons lengthwise, Hinckley, insets *Am C E* \* v 26-92

**Bright**, Charles T. (full) *El Rev Lond* May 11, *Inst C E* v 93-88, por. *Sc Am Sup* \* July 7, *The Eng* May 11-88

**Briquette**-making machine, Paris exhib. *Eng* \* May 24-89

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*Eng* Sep 14-28, Oct 5-26, Nov 2-88, official local guide, Newcastle, bk. review Sep 6, ed. 13, 20, 27, Oct 4-25-89, Aug 22, Abel, Pres. addr. Sep 5-26, Oct 3-17-90, Roberts-Austen, Pres. addr. Aug 21, 28, Sep 4-25-91, Aug 12-26, Sep 2-16-92 *Sc Am Sup* Dec 21-89 \* Oct 11-25, physics at, Nov 29-90; *The Eng* Preece addr. Sep 7, Bramwell addr. 7-88, Sep 13, 20-89, Leeds, Abel addr. Sep 5 \* 12, Noble addr. 19-90, Aug 28-91, Unwin, Pres. addr. Aug 5-19-92

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**Britton**, Hiram M. *R & Eng* Sep -89



- Bronze**, aluminum bronzes, diag. *E News* \* Feb 8-90; monumental uses of, Gardner *Sc Am Sup* \* Mar 24-88, *Soc Arts Lond*; Stone's pat. *The Eng* \* Apr 24-91
- Brooklyn**, navy yard *Eng* Oct 17-90. See also BRIDGES — RAILROADS, Brooklyn, etc.
- Brooks**, David, por. *El Wild* \* June 6, *F Inst* July -91
- Brown**, C. E. L., por. *El Wild* \* Oct 17-91
- Brown**, John *Inst C E* v 95 -89
- Brown**, Samuel *Inst C E* v 109 -92
- Brown**, Thomas *Inst C E* v 92 -88
- Brown**, William A. *Inst C E* v 95 -89
- Brush**, Charles F., por. *El Rev* \* Aug 2, *Harpers W* July 26-90
- Buarque**, Antonio L. *Inst C E* v 100 -90
- Buchholz**, John A. A. *Inst C E* v 101 -90
- Buddicom**, William B. *Inst C E* v 91 -88
- Buell**, Madison, por. *El Eng* \* Aug 19-91
- Buenos Ayres**, gas supply, Stevenson *Inst C E* v 103 -91
- Buffalo**, N. Y., map *Eng* \* Nov 30-88, *El Rev* \* Feb 20-92
- Buildings** and building, notes *E Mag* Oct -91. See also ARCHITECTURAL eng; ELECTRIC light stations; EXHIBITIONS; FOUNDATIONS; MILL construction; RAILROADS, buildings; RAILROADS, electric power stations; ROOFS, etc.
- AGRICULTURE, World's exhib., Chic. *Eng* \* Apr 29, \* May 6-92
- ALLEGHENY County Courthouse *E Rec* \* Nov 10-88
- ANCHORING of, Goetz *Sc Am Sup* \* Dec 21-89
- ARCADE, Cleveland *E Rec* \* Mar 21, 28 \* Apr 4-91
- ARMORY, O. N. G., Cincin. O. *E Rec* \* Dec 7, 21-89; 12th reg't, N. Y. \* Jan 7-88
- ASSOCIATIONS *Sc Am Sup* Dec 28-89
- AUDITORIUM, Chicago *Eng* \* Apr 3, 24-91, *E Rec* \* Apr 12, construction \* Nov 22, 29-90, \* Feb 21, \* Mar 7-91; *Locom* May -90
- BATHS, European public *E Rec* \* Apr 18, special bath-room \* Oct 3-91
- BEAM anchoring, Goetz-Mitchell sys., com. rep. *F Inst* \* Nov -91
- BOILER shop, Pitts. Locom. works *R Gaz* \* Feb 7-90
- BOSTON Chamber of Commerce *E Rec* \* May 7, 28, \* June 4; building law, Aug 6-92
- BRIGHTON beach hotel, Coney Is., moving *E News* Apr 7-88, *R Gaz* \* Apr 6-88



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**Buildings**, FIRE-proof, slow burning construction, Woodbury *Eng* Apr 10-**91**; interior, Carrere *E Mag* \* Oct -**92**; construction, floors *E News* \* Nov 9-**89**, do. Haesecke \* Apr 12, do. cost, etc. \* 19; Schneider floor \* Feb 8; plaster boards, Bush, cor. May 10-**90**; floor arches, St. Louis tests *E Rec* \* May 7; Smith & Randolph, N. Y., floors, Oct 29, Nov 5 \* 12 -**92**. See also FIRE protection

**FLOORS**. See BUILDINGS, fire-proof floors

**FOUNDATIONS**, Columbia Elevator, Prov., new, Hawks *E News* \* Feb 25-**88**; Chicago, Sooy Smith, and ed. (full) Oct 13-**92**; heavy *E Rec* Jan 31-**91**, *Lond Architect*; World's Columbian exhib., Gottlieb *J Assoc E Socs* Dec -**91**. See also FOUNDATIONS

**HIGH**, *Am C E* wind bracing in, Quimby, discuss. \* v 27 -**92**

*E Mag* tall office, of N. Y., J. Robinson, insets \* May -**91**, dangers from, Goetz \* Mar, past and future, Adler, Sep, light in, do. insets \* Nov -**92**

*E News* in cities, ed. Jan 19-**89**; steel skeleton type of, Purdy \* Dec 5, 12 \* 26-**91**, \* Jan 2, Milliken, cor. \* 9, heavy timbering, new methods \* July 28-**92**

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**HOSPITAL**, Boston City *E Rec* \* Jan 4-**90**; Children's, Berlin \* Sep 8-**88**; Ogden, Utah \* Feb 7-**91**; portable, or barracks, Nieden's *Sc Am Sup* \* Jan 14-**88**

**HOTEL**, Park Central, Hartford, destruction of, *Locom* Mar-**89**; Ponce de Leon, Fla. *E News* \* Mar 16-**89**

**HOUSES**, residences, insets *E Rec* \* files **88-92**

**IRON**, skeletons for, Breithaupt *E Rec* \* Mar 5-**92**; structures, strength in compression at high temps., Moller, abs. *Inst C E* v 92 -**88**, *Verhand Gewer* -**87**; mill, Seaver *R Gas* July 15 -**92**. See also BUILDINGS, high

**LAW**, use, J. Robinson *E Mag* Aug, Sep, Henry, Nov -**91**; enforcement, T. Clark *Tech Q* Sep -**87**, Feb -**88**; National regulations, proposed *E Rec* Apr 25-**91**; Boston, Dec 20-**90**, Aug 6-**92**; Bridgeport, Aug 31-**89**; N. Y. Apr 30-**92**



- Buildings**, LIBRARY, Newark, N. J., insets *E Rec* \* Oct 26-89;  
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- MACHINERY Hall, Paris exhib. *E Rec* \* Aug 24 \* Sep 7, 21, 28 \*  
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- MADISON Sq. Garden, N.Y. *E Rec* \* Aug 30 \* Sep 20, 27-90, \*  
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- MANUFACTURES, World's Columb. exhib., inset *E News* \* Sep 1  
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- MARKET Hall, La Plata, Ende *The Eng* \* Nov 28-90
- MASONIC Temple, Chic. *Eng* \* Aug 7-91
- MATERIALS, market, '89 *E & Min* Jan 4-90; Xylolith (wood-  
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- MAUSOLEUM, or campo santo, N.Y., (full) *Sc Am Sup* \* Jan 4-  
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- METROPOLITAN opera house, N. Y., construction *E Rec* \* June  
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- MILL, construction details, Hutchinson, inset (full) *E News* \*  
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- MONMOUTH Park Assoc., N. J., grand stand *E News* \* Jan 18,  
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- MOVING, Brighton beach hotel, Coney Is., N. Y. *Sc Am Arch*  
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- MUSEUM, and arrangement, Ferree *E Mag* \* Nov -91
- N. Y. Music Hall *E Rec* \* July 4-91; N. Y. World (Pulitzer)  
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- OLYMPIA, Nat. Agric. Hall, roof erection, *Read Eng* \* Dec 28  
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- ORCHARD house *Sc Am Sup* \* May 19-88
- PALACE of Chapultepec, Mex., grand stairway *E News* \* May  
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- PARIS Post Office *Sc Am Sup* \* Aug 25-88
- PAVILION, Coney Is. *E Rec* \* Nov 9-89
- PHOENIX girder shop, Pa., framing *E Rec* \* Apr 7-88
- PRISONS, French *E Rec* \* Oct 6-88; Lack. Cty. \* Nov 30-89



- Buildings**, PONCE de Leon hotel, Fla., concrete construction  
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- PORTABLE, Ducker's *Eng* \* Feb 3-88; hospital or barracks  
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- PROTECTION, electric, against water overflows, Weil *F Inst* Oct  
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- REPAIRS and restoration, hints to workmen *E Rec* Nov 19-92
- RIDING School, 75th st. N. Y., elevated ring *E Rec* \* June 16-88
- ROOF water removal, Porter *E Rec* May 4-89, *Tech Q* \* Feb  
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- ROOKERY, Chicago *E Rec* \* Nov 3-88
- St. Augustine, Fla., concrete construction, Ponce de Leon, etc.  
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- STONES, and decorative, of Egypt *E & Min* Feb 25-88; British,  
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- STOREHOUSE construction, standard, Woodbury *E & Min* Apr  
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- Bull's** patent metal *Eng* July 26-89, *The Eng* May 25-88
- Bullet** probe, telephonic, Girdner *Sc Am Sup* \* Mar 3-88
- Bullmore**, Frederick C. *Inst C E* v 92 -88
- Bullock**, Milan C., por. *E & Min* July 25-91
- Burglar's** kit *Sc Am Sup* \* Oct 4-90



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**Burrell**, Percy *Inst C E* v 103 -91

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*E News* electric and animal power, relative econ., cen. bull, report, May 23, Badger, Oct 24; life of grip-faces and cables. July 11; carrying across a draw-bridge, proposed method, Church's, Sep 19; elec. and horse, relative econ., Badger, Oct 24; motive power, prog., J. Robinson, Nov 7-91, do. com. report *E Rec* Feb 20, 27, Mar 5, 12, 19, Apr 16; elec. and horse, relative cost of op., report, Oct 29-92

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- Cable Railroads**, BIRMINGHAM, England, st., ed. *Eng* Mar 30, *Sc Am* Nov 3, *The Eng* June 22, 29, 29, Sep 28, 28-88
- BROOKLYN bridge, N. Y., Leverich, insets *Am C E* \* v 18-88, inset *Eng* \* Oct 5 \* 26, Nov 9, 16, 30-88, abs. *Inst C E* v 95-89; terminals, com. report and ed. *R Gaz* \* Apr 27-88, (full) *St R J* \* July, grip \* Dec -90
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- CLEVELAND City *St R J* \* June -91
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- EDINBURGH No. Tramways *E News* \* July 20-89, Colam (full) *St R J* \* Jan -91, *The Eng* \* Aug 8, 8-90
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- GREAT Britain, and electric, McCallum *St R J* Oct -92
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- HECKERT system *St R J* \* Aug -88
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- LIGHT road construction, Van Vleck *Am M E* \* v 11 -91, *E News* \* Nov 22, roads \* 29 *St R J* \* Dec -90
- LONDON, England, electric and *El Rev Lond* Sep 16-92
- LOS Angeles, Cal. *Eng* \* Aug 28-91; cable viaduct *E News* \* Jan 25-90; Nov 7-91; single-post viaduct, Hawgood, Temple st., Wood, inset *Inst C E* \* v 107 -92; *Sc Am Sup* \* Oct 10-91; *St R J* \* Mar, Temple st. Co. \* Sep -90
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- 3-92; mineral resources, ed. *The Eng* Jan 2-91. See also MINES; QUEBEC; RAILROADS, Can. Pac., etc.
- Canals**, ship, in 1889, Peary *Am C E* v 21 -89, do. (full) *Sc Am Sup* Aug 31-89, Feb 1, 8-90; vs. railroads, ed. *Eng* Aug 24-88; inland waterways development, Marten, Aug 15, Congress, internat. \* Aug 8-29, Sep 5; water transport. in different countries, Jeans, bk. review, Dec 19-90, European, ed. Nov 18-92; construction, mechan. appliances, E. Williams \* Sep 25-91, do. *E News* \* Oct 31, minimum width, ed. June 27-91; in 1889, Aug 8, 10-89; English system, Aug 16; Congress, Aug 30, Sep 6-90; inland nav., European *E Rec* Nov 22, 29-90, Internat. Congress on, consolidation of canal banks \* Sep 3, 10, Oct 1; Haupt *F Inst* Nov -92; Congress, report, abs. *Inst C E* v 95 -89, \* *An Ponts* v 15-88
- The Eng* inland, development, Aug 3-88; the canalization of rivers, Boulé \* Jan 18 \* Feb 15 \* Mar 22 \* Apr 26 \* May 24, June 21; and inland nav., Wheeler, Feb 8, 22, Mar 8, Apr 5-89; and railroads, relative advantages for transport. Oct 3-90; and inland nav. in 1890, Jan 2-91, do. France, map \* Oct 21; water supply of \* Aug 26-92. See also IRRIGATION, Am. eng; RIVERS, Main, canalization, etc.
- AMERICAN Isthmus interoceanic commun., Barroll, maps (full) *R & Eng* \* Apr — \* Aug -90
- BALTIC & North Sea, floating elevator, inset *Eng* \* Feb 20; *E News* \* Aug 1, Oct 17-91 \* Mar 26-92; *R & Eng* \* Apr -91, *Mittheil Seewesens*
- BELGIUM, canal du centre, hydr. lift at La Louviere *Eng* \* Oct 12-88; river and other works in Bel., France and Germany, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96 -89
- BIRMINGHAM & Liverpool ship, proposed *E News* Oct 25, *R Gaz* Oct 3, map *The Eng* \* Sep 26-90
- BOISE river, Idaho *E News* \* Apr 26-90
- BOATS haulage and Bovet's magnetic pulleys *El Rev Lond* \* Oct 21-92; propulsion, a suggestion in. Vogt *Sc Am* Mar 16-89; traction by cable *Sc Am Sup* \* Jan 26-89. See also CANALS, cable towing on
- BRUGES maritime *The Eng* \* June 17-92
- CABLE towing in France *R & Eng* \* Apr; Chatelier \* Nov -89, Goodwin, cor. Feb -90; *Sc Am Sup* \* Jan 26-89
- CASCADES, locks *E Rec* \* Oct 8, 15-92



**Canals, CHICAGO drainage** *E News* \* June 2, 30-92

CORINTH ship, St Yves, Greece *E News* \* Jan 17-91, abs. *Inst C E* v 96-89 \* *An Pontis* v 16-88; *R & Eng* Sep -90; *Sc Am Sup* July 14-88

DOLORES, Col., head gates and boom, inset *E News* \* Jan 4-90  
EMS-Jade, Kurs, abs. *Inst C E* v 92-88, *Deut Bauz* -87

FINLAND, roads and railroads, Strukel, abs. *Inst C E* v 99-90, *Allgem Bauz* -89

FORTH & Clyde ship, Scot., proposed *Eng* Feb 14, Crawford, Aug 29-90; *E News* Dec 14-89, Apr 25-91

FRANCE, cost of motive power on, *E News* June 14-90; river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96-89; internal nav. in *R & Eng* Jan -90. See also CANALS, Havre

GANGES, lower, failure of Kali Nadi aqueduct, Thelnall, abs. *Inst C E* v 95-89, construction, Good, inset \* v 105-91

GERMANY, Belgium, France, river and other works, Vernon-Harcourt, discuss., insets (full) *Inst C E* \* v 96-89

GREAT Britain, Soc. of Arts conference *R Gaz* July 27-88; inland nav., Clements *The Eng* Aug 15, 22-90

GREAT Western ship, England, proposed, map *Eng* \* Oct 12-88

HAGUE, renewal of water in, Pichler, abs. *Inst C E* v 95-89, *Woch Ost Ing* -88

HAVRE to Tancarville, Widmer, abs. *Inst C E* v 110-92, *An Pontis* May -92; *Sc Am Sup* \* Sep 15-88, *La Nature*

HUDSON river ship and great lakes, North *E News* May 5, *Forum* May -92. See also CANALS, Lakes

INDIA, ed. *Eng* Oct 14-92

JURAPA irrig., Finkle *E News* \* May 17-90

KIOTO & Lake Biwa, Japan *Eng* \* Jan 25-89

LAKES, Erie & Ohio river ship, proposed *E News* \* Mar 21, do. *R Gaz* Apr 10-91; Great lakes & Atlantic seaboard enlarged waterway, Corthell *Eng* July 17, 24, do. *E News* Apr 18 \* 25, do. (very full) *Sc Am Sup* July 4-91, *J Assoc E Socs*; Superior & Mich., proposed, maps *E News* \* Mar 22-90

LIFTS, hydr., Prussman's *Eng* \* Oct 14-92; lifts on, Harcourt *E News* Aug 4-88; hydr., Belgium *R & Eng* \* Mar -89, *Genie Civil*

FONTINETTES, France, hydr. *E & Min* \* Sep 29-88, \* *Industries*, vertical, Hoppe system, Petri *E News* \* May 9, 23-91, *E Rec* \* June 23 *R Gaz* \* Sep 28, *Sc Am Sup* \* Sep 29-88, *The Eng* \* Dec 21-88 \* Jan 11, 25 \* Feb 15-89



**Canals, Lifts, LA Louviere, Belgium, hydr.** *Eng* \* Oct 12, *The Eng* Dec 21, 21-88 \* Jan 25, 25-89

LIVERPOOL & Birm. See CANALS, Birmingham

LOCKS, accident, Sault Ste Marie *E & Min* \* Aug 30-90; of 20 metres (65 ft.) lift, Fontaine's *E News* \* Sep 19-91; Cascades *E Rec* \* Oct 8, 15; gates, distrib. of beams in, Stoney *The Eng* \* Apr 1; adjustable and weir, Hale, cor. \* May 6-92  
 MANCHESTER ship, ed. *Eng* June 8, 15, 29, July 20, Sep 7, 21, Oct 5, ed. Dec 21, 28-88, Apr 25, Wins \* Aug 29 \* Dec 5-90 \* Jan 16 \* Feb 13, 27 \* Mar 13, 27 \* Sep 11 \* Oct 2, ed. Dec 4-91

*E Mag* Dunell \* Nov, Dec -91; and Corinth *E News* June 30, July 28, Aug 4 \* Sep 29-88, profile \* Jan 11-90; *E Rec* \* Sep 29 \* Nov 17, Dec 8, 15-88, Feb 16 \* June 8, 15, July 27 \* Sep 7 \* Oct 5, 28-89; mechan. appliances, Wins, insets *Inst M E* \* July -91; Harrison *Locom* Dec -89; *R & Eng* \* Oct -90; *R Gas* Sep 14-88, Hansel, map \* Aug 19-92; Wells *Sc Am Sup* Feb 16-89, map \* Aug 16-90

*The Eng* Wells, Sep 21. and Barton aqueduct, Nov 2-88; \* May 24-89 \* Jan 31, map \* July 11 \* Aug 22 \* Oct 10, Nov 14-90, Weaver river sluices \* Jan 9 \* Mar 6, 13 \* July 17, 24 \* Aug 21 \* Oct 2 \* Nov 6, 27-91, prog. \* May 13 \* Aug 12, 19, Sep 16 \* Nov 18-92

MARNE & Saone, Florentin, abs. *Inst C E* v 105 -91, *An Trav Pub* -91

MERCED irrig *E News* Feb 4-88

MICHIGAN & Superior lakes, proposed, maps *E News* \* Mar 22-90

NEW York, state imp. *E News* Aug 18-92; & Phila. ship (Del. & Raritan rivers), proposed, Haupt, inset *F Inst* \* Mar -92

NICARAGUA ship *Eng* Menocal \* Aug 22, Dec 26-90

*E & Min* maps (full) \* May 4-89

*E News* surveys, June 16, ed. n 30, Menocal \* July 7, 14 ed. 14, Peary, Aug 18, 18-88, map and inset \* Sep 14, 14-89, proposed guarantee, ed. Feb 7, notes \* May 30, \* June 6, ed. 6, 13, 20, 27-91; engineer's report and ed. Dec 15, 15-92; *E Rec* May 23-91

*F Inst* and Panama, notes, Oct -88, Taylor, Jan, profile \* Feb, Am. Isthmian routes, Ammen, Dec -89; Davis, inset (full) \* July, Aug -92; Diebitsch *Lehigh Eng* Feb -89



**Canals, NICARAGUA**

*Forum* Miller, Merry, Feb -92; *R Gaz* Aug 29-90

*Sc Am Sup* (full) \* Feb 2, 16, 16 \* Mar 2-89, Peary, Jan 11, 18-90

*The Eng* Feb 17-88, \* June 12 \* July 3, Aug 14, Nov 6, 27-91  
NORTH Sea, Amsterdam, Huet, abs. *Inst C E* v 99 -90, \* *Tijd Konin Ing* -88-89. See also CANALS, Baltic

PANAMA interoceanic ship, plant and material, Williams, insets (full) *Am C E* \* v 19 -88; Isthmus canal and our Gov't. *Atlan M* Mar -89

*Eng* Rogers Apr 20, June 8, ed. Dec 21-88 \* Jan 11, locks, inset \* Nov 1-89, directors, ed. Nov 25-92

*E News* locks, proposed \* Feb 11 \* Mar 10, actual status, profiles, ed. etc. \* June 2, 2, water supply 16, what the Slaven dredges are doing, Appleton, cor. 16, actual status, Snow, great Culebra cut, ed. \* 16, 16, recent trip over, Lockett, 23, and Nicar., ed. July 14, prog., cor. 28; Aug 11, de Lessep's report, ed. 18; plant and machinery, Williams \* 18 \* 25; financial status, ed. Dec 8-88; cost, etc. Oct 19-89

*E Rec* Rogers (full) \* Jan 28-88; McAlpine's opinion, Feb 22-90; completion, report, May 30-91; *The Eng*; works, Nansouty, abs. *Inst C E* v 92 -88, \* *Genie Civil* v 12 -88; (cost) *R & Eng* Feb \* June -91; new, Crowell, cor. *R Gaz* Oct 28-92

*Sc Am Sup* work on \* Mar 10, locks \* 31, \* July 21 \* 28 -88, \* May 25, Wins (very full) \* June 1, 8, 15-89, projects for completion, Malgarini's \* Nov 12-92

PECOS Valley, New Mexico *E News* \* Oct 17-91

PENN., L. Erie & Ohio river, proposed *E News* \* Mar 21, do.

*R Gaz* Apr 10-91. See also CANALS, Lakes

QUEBEC-Montreal ship channel *Sc Am* Mar 16-89, *Eng*

RICHMOND, Va., eng. problem at, Adams *Am M E* \* v 12 -91

SAULT Ste. Marie, ed. *Eng* Sep 14-88, Sep 5-90; *E News* Jan 4, traffic for nine seasons, Mar 1-90; lock accident *R & Eng* \* Oct -90; and Suez, traffic *R Gaz* Apr 17-91; *Sc Am Sup* Oct 20-88

SIBERIA, new waterway, abs. *Inst C E* v 92 -88, *Osterreich Ing* -88; Mas *R & Eng* Sep -89, *An Ponts*

SIDHNAI system, MacLean, abs. *Inst C E* v 103 -91

SPAIN, inland nav., abs. *Inst C E* v 104 -91, *An Construct* Madrid -90



**Canals**, SOUTH Yorkshire junction, proposed *The Eng* \* Oct 17-90

SUEZ, traffic growth *E & Min* Apr 20-89; ships passed through *E News* Apr 28, June 9-88, report, July 6-89, traffic diagram \* July 11-91; and Sault Ste. Marie traffic *R Gaz* Apr 17-91; lighting of *The Eng* \* Dec 6-89

SUPERIOR & Mich. lakes, proposed, maps *E News* \* Mar 22-90

WASTE weir, aut., Foote, inset *Am C E* \* v 18 -88

**Canes** and sticks manuf., Jackson *Sc Am Sup* May 11-89; cane contrivances \* Nov 28-92

**Canning** fruit *Sc Am Sup* Jan 4-90

**Capital** and labor, the rights of *Blackwood's Mag* Dec -91; conflicts, Howell, bk. review *Eng* Aug 29-90; the remuneration of, ed. Dec 11-91; does capital need high-priced labor, Partridge *E Mag* Aug -92; how to secure harmony between, Hewitt *E & Min* Oct 11-90, *Am Min*; the consumer, Rice *Forum* July -92; are business profits too large, Mann *Pop Sci* Nov -92. See also LABOR; MANUF. industries net profits

PROFIT-sharing, co-operation, B. Jones *Eng* Sep 19-90; industrialism, Esson *El Rev Lond* Nov 7, 14-90; gain-sharing Towne *Am M E* v 11 -89; profit sharing enterprises, ed. *Eng* Feb 13, ed. July 31-91, Gilman *Soc Arts Mass* -89

**Carbon**, bisulphide manuf. and purification, Singer (full) *Sc Am Sup* \* Apr 20-89; funnel, for filtering, Drown *Tech Q* May -88; heat of combustion, Berthelot *R Gaz* July 26-89, *Compt r*

**Carbonic** acid liquid manufacture *Sc Am Sup* \* June 27-91

**Carborundum**, Guy *Sc Am Sup* July 16-92

**Carnegie**, Andrew, por. *E & Min* \* July 4-91

**Carpenter**, R. C., por. *Cassier's* \* Jan -92

**Carpet** beating machines *Sc Am Sup* \* Apr 21-88; industry, Phil. Apr 13-89; weaving, Persian, Vries, Aug 29-91, *J Soc Arts Lond*

**Carr**, Henry *Inst C E* v 95-89

**Carr**, Mark W. *Inst C E* v 93-88

**Carriages**, elastic traction, Lemoine's *Sc Am Sup* \* Oct 8-92; torsion in, King *The Eng* \* Aug 28-91

**Carrick**, John *Inst C E* v 101 -90

**Cars** and carriages, Railroad, rolling stock, Paris exhib. *Eng* Aug 30-89, local R's, inset \* Apr 4-90; standards, good and bad *E News* June 9-88



**Cars, ACCOUNTANT's Assoc. pro. *R Gaz* June 29-88**

AXLES, steel, Coffin *Am ME* \* v 9 -88; effect of temp. on strength, Andrews *E News* \* Feb 18, 18, 25-88, Nov 14-91, do. inset *Inst CE* \* v 94 -88, insets \* v 105 -91; and wheels, machine for rolling, Aitken's ap., pats. *R & Eng* \* Sep -90; wheels and track, discuss. *R Gaz* Feb 17; 60,000-lb. cars, standard, proposed \* June 8-88, do. Rhodes and ed. \* Feb 22, 22, Mar 1, discuss. 29, M. C. B. \* Oct 11; steel, tests, Pencoyd works, Nov 8-89

AXLE and journal-boxes, lubricating, cost, Randolph *Am ME* \* v 11 -90; stamped steel *Eng* \* June 20-90; Macnee's dust proof *E News* \* Dec 15-88 \* May 2-91; bearing for 60,000-lb. cars, M. C. B. Assoc. com. report \* June 14-90

*R Gaz* anti-friction metals, Bennett, Jan 18, 25; Erie journal-box \* Sep 20; and bearings, Adams, Nov 22-89; 60,000-lb. cars, proposed M. C. B. \* June 20-90 \* June 19-91; stamped steel \* July 18; standard, proposed \* Aug 22-90; the Timms *The Eng* Apr 13-88

BRAKE, Kane's *Sc Am* Feb 16-89. See also RAILROADS, brakes  
BRUNIG, Paris exhib. *Eng* \* Aug 23-89

BUENOS Ayres & Ensenado Port, buffet smoking *The Eng* \* Feb 20-91

BUFFER, Westinghouse friction *R Gaz* \* Nov 2 \* Dec 21-88 \* Feb 21-90, *The Eng* \* Mar 14-90

BUILDER'S Assoc., Master, pro. *E News* June 23-88 \* June 13, 20-91, June 16 \* 23-92, reports *R & Eng* \* July -92, table, inset (full) *R Gaz* June 15 \* 22-88, June 28, July 5-89, June 13 \* 20-90, June 12, 19-91, June 17, inset \* 24-92

CALEDONIAN R., inset *Eng* \* Feb 21-90

CATTLE, So. R., France, wagon, Paris exhib., inset *Eng* \* Nov 8-89; the Canda *R Gaz* \* Mar 2-88

CHOCK, for stopping *E News* \* Aug 9-90

CLEARANCE in width required by *R Gaz* \* Nov 9-88

COAL, Chic. Rock Is. & Pac. standard, inset *E News* \* Aug 11 -92; Tex. & Pac. *R & Eng* \* Nov -91; standard \* Apr \* May -92

COUPLERS, standard, dims. *E News* \* Jan 28-88; contour lines, etc., Barnes \* Jan 3-91; breakages, service record and ed. \* Feb 15, 15-90 \* May 12-92; and brake legislation *R & Eng* Mar, May -92; vertical plane, in service, ed. *R Gaz* Jan 17; frt., C. B. & Q., broken \* June 6-90; vertical plane,



**Car COUPLERS**

Barnes, and aut. air brakes \* Jan 2, Feb 6, ed. 6; what constitutes a defect in ver. plane, discuss. 23, mixed unlocking gear disadvantages \* Nov 13-91; strength, Forsyth, Mar 4, 11-92

BLACKSTONE's platform and *R Gaz* \* July 15-92

BUHOUP's *E News* \* August 25-92

CHICAGO, the *R Gaz* \* Nov 14-90

DREXEL *R Gaz* \* May 15-91

EMPIRE *R & Eng* \* June -92

FOX aut. vertical plane *R Gaz* \* June 20-90

HINSON *E News* \* Aug 1-91

HUSELTON aut. *R Gaz* \* Apr 11-90

JANNEY frt., safety stop for *E News* \* Jan 2-92; *R Gaz* \* Feb 17-88, vs. Miller, ed. Apr 11, evolution of \* June 6, life of, diagrams of broken \* Nov 7-90, with Bentley's vestibule \* May 1-91 failures \* May 13-92

KEYSTONE *E News* \* Nov 2, *R Gaz* \* Nov 8-89

MASTER Car Builder's aut. *E News* introduction of, ed. Mar 28, R's equipped with, inset map \* Apr 25, 25 \* June 13, standard gauges for \* Sep 19-91, strength, Forsyth \* Mar 5-92

*R & Eng* form of contour lines, report \* May -88, standard gauges \* Oct -91, possibilities of, discuss., Eastwick (full) \* Apr, May -92

*R Gaz* \* Apr 20-88, at interchange points, ed. \* July 25 \* Aug 18, on curves \* Oct 3-90, broken knuckles \* Jan 2, cost, ed. May 15, report \* June 12, standard gauge \* Sep 18-91, M. C. B. Assoc. action, Apr 22, testing machine \* Sep 2-92

ROBERT-Eastwick *R Gaz* \* June 6-90

TESTING, method *R Gaz* \* Aug 19, testing machine \* Sep 2-92

THURMOND frt. *R Gaz* \* June 5-91

TROJAN *E News* \* Nov 20, *R Gaz* \* Dec 5-90

UNION aut. *R Gaz* \* Jan 30-91

VAN Dorston and buffer *R Gaz* \* Dec 14-88

DERRICK, 15-ton, Penn. *R Gaz* \* Oct 18-89, 10-ton, Balt. & O. \* Jan 9-91

DRAW-bars, height of M. C. B. com. report *E News* June 28-90; Graham's draft rigging, Penn. R., discuss. *R Gaz* \* Mar 29, 29; Cushing's stop \* Oct 25; Chic & N. W. \* Nov 1-89; Safford aut. \* Oct 17-90; Butler draft gear \* Apr 1; draft gears for frt. cars, Barnes \* June 3-92



**Cars, DUMP**, Can. Pac. *E News* \* July 21-**88**; rotating \* July 12-**90**; iron, No. R. of France *R & Eng* \* July -**88**; the Goodwin \* July -**89**; Thatcher compressed air \* Dec -**92**, do. *R Gaz* \* Nov 11-**92**; George's Creek & Cumb. \* Jan 25-**89**; and gondolas, Goodwin, Jan 31; standard, B. & A. \* Mar 7-**90**

**FRANCE**, experimental, West. R., Paris exhib. *Eng* \* Oct 4; local R's 2d class, Paris exhib. \* Nov 29; 1st class, So. R, inset \* Dec 13-**89**; State R \* July 4-**90**; pass. *R Gaz* \* May 15-**91**. See also CARS, dump—freight

**FREIGHT**, Goodfellow & Cushman's *Eng* \* Dec 7-**88**; unloading by steam shovel *E News* \* Oct 5-**89**; construction imp., Barnes \* Jan 30; lubrication, cost, Dec 1-**92**

*R Gaz* relative cost of car load and less, Fink, Feb 3; depreciated values, table, Apr 27; ballast and plow, Roger's \* July 27-**88**; equity of per diem and mileage plan, Yardley, Wattson, cor. Mar 15, Apr 5; relative econ. of large and small capac., ed. Apr 26; springs, bolster, tests, Hazlehurst, diags. \* Oct 4-**89**; end platforms for, ed. Jan 10; housing for gondolas and stock \* Mar 28; ventil., Pancoast's system \* Apr 11; mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore Oct 10-**90**; Harvey steel box \* June 5-**91**; construction and design, Barnes \* Jan 29, Lamont's steel \* Feb 5-**92**

**BALT.** & O. 50,000-lb. box, details *R Gaz* \* Mar 27-**91**, iron box *R & Eng* \* Dec -**92**

**BELGIUM**, Grand Cen. R. wagon, Paris exhib. *Eng* \* Oct 11-**89**

**BUFFALO**, Roch. & Pitts. 60,000-lb. box and truck *R Gaz* \* Dec 19-**90**

**CHESAPEAKE** & O., combination *R Gaz* \* Feb 1-**89**; stone \* Sep 23-**92**

**CHICAGO**, Bur. & Q. standard *R Gaz* \* June 21-**89**; & N. W. standard, 50,000-lb., box (full) \* Jan 10-**90**; Rock I. & Pac. coal, standard, inset *E News* \* Aug 11-**92**

**DENVER** & Rio Grande box, standard gauge *R Gaz* \* Oct 9-**91**

**FRANCE**, So. R. cattle wagon, Paris exhib., inset *Eng* \* Nov 8, platform wagon, do. \* Dec 20-**89**

**GERMAN** composite *R Gaz* \* Dec 27-**89**

**HOELLENTAL** R., inset *Eng* \* Mar 13-**91**

**INTERCHANGE** rules *R Gaz* May 24-**89**, com. report, May 22-**91**

**LAKE Shore**, 30-ft. standard *R Gaz* \* Dec 30-**92**



- Cars, Freight**, LEHIGH Valley, 50,000-lb. standard *R Gaz* \* June 8; twin hopper bottom gondola, 60,000-lbs. \* Sep 14-88; 50-ton capac. platform car \* Aug 16-89
- NEW York, L. Erie & W. side-dump, 80,000-lbs. capac. *E News* \* Apr 19, 19-90
- NEWPORT News & Miss. Valley gondola *R Gaz* \* Apr 6-88
- NORTHERN Pac. hopper side chute *R Gaz* \* Apr 5-89
- PENN. 100,000-lb. *R Gaz* \* May 11-88; 40-ton side-dumping gondola \* Mar 15-89
- SPAIN, 13-ton iron ore wagon, Parcocha R., inset *Eng* \* July 17-91
- TUBE-frame, Jefferds *Eng* Nov 7 \* 28-90, do. goods wagons, insets (full) *Inst M E* \* Oct -90, do. cor. *R Gaz* June 5-91, do. and effect on expenses of R's *The Eng* \* Nov 14-90
- GATES, the Gold platform (N.Y. eleva. R.) *R Gaz* \* Nov 30-88; B. & A. \* Mar 21-90
- GREAT So. & W. of Ireland, composite *Eng* \* Oct 19-88
- GREAT Western, England, corridor cars *E News* Mar 26 \* Apr 28, *The Eng* \* Apr 15-92
- HEATING, Bache's heater, com. report *F Inst* \* Aug -88; Leland hot water heater *R Gaz* \* Sep 11-91; hot water continuous, Safety Co. \* Sep 6-89
- STEAM, notes on, Baldwin, a safety system, Towne *Am M E* \* v 9 -88; safe train system, Gibbs' car *El Wild* \* June 21 -90; appliances *Eng* \* Mar 4-92; Waitt *E & Min* \* Oct 1-92
- E News* steam from the locomotive, com. report, June 30; Baldwin \* Aug 18-88; non-pressure system \* May 18-89; by direct steam, June 7 \* Nov 22: prog. of steam heating, inset map and ed. (full) \* June 7, 7; Consol. Car-heating Co. systems \* Sep 6, do. aut. temp. regulator, 20-90; diagram \* May 16-91; standard couplings \* June 16; Waitt, Sep 29 -92; P. Atkinson *Lehigh Eng J* June -89
- R Gaz* aut. control of heat, Temple, Apr 13; expts., discuss. 20 \* May 18; Stand. Car Htg & Ventil. Co. continuous system \* June 15; M. C. B. expts., report, inset table and ed. 22-88; essential elements of, W. Johnson, Feb 1; continuous, cir. replies, Mar 22, Apr 12-89; Consol. Car H. Co. couplings \* May 2; econ. of, Sewell, Nov 7-90; Halladay, Sep 23, Waitt, 30-92; econ. of, Sewall *Sc Am Sup* Nov 29 -90; Lanza \* *Soc Arts Mass* -89, *Tech Q* \* Oct -88; and couplers *The Eng* Jan 27-88



**Cars**, Heating, Steam, CALEDONIAN R., exhaust steam ap., Drummond *Inst C E* \* v 92 -88, *The Eng* \* Jan 4, 4-89

CHICAGO, Mil. & St. P. contin. *R Gaz* \* Jan 13-88, light and heat tender (full) \* June 13-90

ERIE system *R Gaz* \* Feb 3-88

GIBBS' safe train system *El Wld* \* June 21-90, steam hose coupler *E News* \* Dec 5-91

GOLD continuous system, Lehigh Valley *R Gaz* \* Mar 9; storage, test, May 11-88; \* Aug 30-89; coupling and joints \* Mar 21; \* June 6; coil and Baker stove \* Dec 26-90

MARTIN coupling *R Gaz* July 18-90

MCELROY system, test *R Gaz* Apr 6-88

NORTH Western system, coupling and trap *E News* \* Mar 30-89; *R Gaz* \* Jan 27-88

PENN. R., Ely *E News* \* Nov 15, *F Inst* \* Nov *R & Eng* \* Dec -90; Williams' system, expt. *R Gaz* Feb 24-88; continuous \* Mar 22-89

ROBERTS' system, *R Gaz* \* Apr 17-91

SEWALL contin. system, hose coupler *E News* \* Nov 21-91; *R Gaz* \* Jan 20-88

WILLIAMS' system, Penn. R., expt. *R Gaz* Feb 24-88

INDIAN State carriages, Rajah *The Eng* \* Nov 4-92

INSPECTION, Susque. Coal Co. *E News* \* Aug 17; Penn. R. \* 31-89; the Ionia *R Gaz* \* Apr 26-89; joint insp., com. report, June 19-91; saloon, So. E. R. *The Eng* \* Aug 14, 21-91

INTERCHANGE rules, M. C. B. report *R Gaz* Apr 8-92

IRON and steel, construction, steel plate and malleable iron in, M. C. B. report *E News* \* June 14-90; steel stock car, inset \* July 11-91; iron con., pros and cons, ed. May 19-92; iron dump frt., No. R., France *R & Eng* \* July -88; iron box, B. & O. \* Dec -92; iron construction, Ettenger *R Gaz* Nov 30-88; Am. steel fire-proof postal \* Jan 4-89; Schoen pressed steel, inset \* May 23-90; steel in car construction, Mar 27; Harvey steel box frt. \* June 5; pressed steel and malleable iron con., com. report \* 12-91; construction and design, Barnes \* Jan 29; Lamont's steel \* Feb 5; Harvey steel construction \* 26; iron and steel box, Mex. R. \* Aug 5-92. See also CARS, tube-frame

LAKE Shore & Mich. So. standard pass. *R Gaz* \* Sep 16-92

LIGHTING, electric, Leonard *El Eng* July 9-90, Bauer, June 8-92, Timmis *El Rev Lond* \* Sep 11-91, do. *El Rev* Jan 11-



**Cars, LIGHTING**

**92**, with storage (secondary) batteries, A. Brown *El Wld* \* June 1-**89**, Bauer, June 11, Silvey storage battery system \* Dec 31-**92**, Sartiaux *Eng* \* Oct 25-**89**

*E News*, systems, cost, ed. and cor. May 25; with storage (secondary) batteries, A. Brown, July 6-**89**; electric, Penn. R., inset \* Aug 23, do. Sartiaux, Nov 1-**90**; modern methods and ed. Mar 7, 7, 14, comparative merits, various systems \* Apr 18, 25 \* May 2-30 \* Aug 15, 22, the Pintsch compressed gas system \* 29 \* Sep 5, 19, 26, oil lamps \* Oct 10, 17, electric \* Nov 14, 21 \* Dec 5, 19-**91**, Mar 12-26, Apr 2, 9, and ed., 16, 16, Bauer, June 9-**92**

*Inst C E* electric, Sartiaux, abs. v 101 -**90**; Langdon, discuss., inset \* v 106 -**91**; *An Telegr* v 17 -**90**

*R Gas* electric, Timmis \* May 18-**88**, ed., Feb 8, Waite, Mar 1, Frost dry carburetter system, Penn. R. \* June 7, elec. light car, Cumb. Val. \* 21, elec., Selden, Oct 25, elec. in Am. and Europe, Sartiaux, Nov 29-**89**, by power from the axles, arr., Lond., Brighton & So, Coast R. \* Jan 3, Gibbs, \* Feb 7, light and heat tender, Chic. Mil. & St. P. (full) \* June 13, elec., Leonard, July 11; Frost carburetter tests \* 18-**90**; Gibbs elec. (full) Mar 6, (cost, various systems) cor. Aug 28-**91**

LONDON & S. W. works, Eastleigh, England, *Eng* \* July 29; bogie composite \* Aug 5-**92**

LUBRICATION, Hall *E News* \* June 27-**91**; lubricants, English, and testing *R Gas* \* Feb 14-**90**

MEXICAN R. iron and steel box *R Gas* \* Aug 5-**92**

PAINTING, Master Car & Locom. Painter's Assoc. pro. *R Gas* Sep 20-**89**, Sep 19-**90**, Oct 2-**91**; M'Keon *Sc Am Sup* Oct 1-**92**

PLATFORM, Miller, and coupler patents *R & Eng* \* Jan -**88**

PORTABLE partition *E News* \* May 30-**91**

PASSENGER, Hoellenthal R., inset *Eng* \* Feb 27-**91**; Am. compartment, Wagner Co. *E News* \* June 16, special, World's exhib., inset \* Nov 17-**92**; Pullman vestibule sleeping *R Gas* \* Nov 23-**88**, Pullman, imps. \* Feb 14; Farmer's, with side entrance \* Sep 19; Wagner compartment sleeping \* Oct 31; Harris sleeping excursion 'Jeannette,' inset \* Nov 28-**90**; Bissell 'Gould' platform and vestibule \* Mar 18; (various roads) dimensions, Dec 30-**92**; Pullman train in England, ed *The Eng* Dec 14-**88**. See also CARS, under names of R's.



- Cars**, REFRIGERATOR, Zimmerman aut. *R Gaz* \* Jan 20-88; the Hanrahan \* Oct 30-91
- REPLACER, Reed's *E News* \* Jan 26-89; the Norwood \* May 17-90; Hynes *R Gaz* \* Jan 3-90. See also BRIDGES, Railroad, guards — rerailers
- ROOFS, M. C. B. com. report *R Gaz* \* June 22-88; Woods, Feb 12-26-92
- SCHOEN pressed steel, inset *R Gaz* \* May 23-90
- SEAT, Forney's *R & Eng* \* June -89; the Emmert *R Gaz* \* Mar 23-88
- SERVICE, Wattson *R Gaz* Jan 23-91; settlements, ed. Jan 29-92. See also RAILROADS, demurrage
- SIGNALS, between pass., guards and engine driver, Urquhart, inset *Inst C E* \* v 106 -91
- SILL repairs and general averages *E News* Aug 11-92
- SLEEPING, discomforts of, ed. *R Gaz* Jan 3-90
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**Crematory furnace**, Key's *Eng* \* Mar 15-89; the Manchester crematorium (dead bodies disposal) \* July 31-91; crematory at Zurich, Geiser, abs. *Inst C E* v 99-90, *Schweiz Bauz* \* v 14-89

**Criminology** researches, Aaron *Sc Am Sup* June 18-92

**Crookes**, William, por. *El Wld* \* Feb 7-91, por. *Sc Am Sup* \* Apr 21-88, por. \* Mar 7, 7-91, *Electrician*

**Crosby**, Oscar T., por. *El Wld* \* May 31-90

**Crosland**, William M. *Inst C E* v 99-90

**Cross**, Charles R., por. *El Wld* \* Jan 3-91

**Crossties**, Railroad, life *E Mag* Apr -91; in France *E News* Dec 14-89; consumption of forest supplies by railroads, Tratman, table, Aug 30-90; preserving methods, Reed, Sep 20-90, Sep 19-91; consumption, France, Mathieu, abs. *Inst C E* v 98-89, *Rev Chemins* July -89; treatment, Austrian R's, Karplus *R & Eng* Dec -88, *Vienna Zeit Eisen*; ties in India *R Gaz* Aug 23-89

**METALLIC** (full) *E & Min* \* Dec 29-88; steel, N. Y. elevated R's \* Mar 2; Aiken's hydr. machine \* Nov 2-89; ed. Feb 7-91; steel \* Aug 13-92

*E News* steel, maintenance expenses on, Post, June 30-88; some Am. June 29; the Flower-Heller \* July 27; Z-iron, Belgium \* Sep 7, report, 7; Mar 16, May 11, Nov 23-89; report, Aug 30-90; 'standard' steel \* Feb 7; Servis, Apr 4; Belgian, July 18; Sandburg, Aug 22-91; Hartford steel tie and 100-lb rail, N. Y. Cen. R. \* Mar 12-92

*Inst C E* metal sleepers, economic value, Hohenegger, abs. v 91-88, *Org Forts Eisen* -87; value of pickling, Ribar



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*Inst C E* v 91 -88, *Zeit Ost Ing* -87; steel, manuf., inseparable clip type, Bamber *Inst C E* \* v 108 -92; France *R & Eng* \* June; Mayer \* Oct -89; Europe \* May -90

*R Gaz* Hartford steel \* Dec 7-88; elastic tie plate, Sandberg's \* Mar 8 \* Apr 5-89; Penn. experimental \* June 6: the Bonzano steel \* Oct 17-90; Indian R's, June 5-91; Reece \* Feb 19; N. Y. Cen. steel \* July 22, manuf. of, Bamber \* 22; Heindl steel, reports of use, Dec 23-92

*Sc Am Sup* \* May 30-90; Hartford steel \* Feb 9-89, *R Rev*; Indian State R. steel sleepers *The Eng* Nov 30-88; Cabry do., No. E. R. \* Jan 4-89

**Crowe**, William M. *Inst C E* v 93 -88

**Crowds**, weight of *E Rec* Dec 24-92

**Crushing** and amalgam. mill, the Crawford *E & Min* \* July 23-92. See also DISINTEGRATORS

**Cryolite** mine, Greenland *Sc Am Sup* Mar 14-91

**Crystallization**, Liveing *Sc Am Sup* \* July 25-91, *Am J Sci*; crystals *Locom* Mar -92

**Cuba**, business opportunities, Chibas, insets *E Mag* \* Nov -92; Havana, St. Jago trade in '87 *The Eng* Aug 3-88

**Culvert**, Harlem arch *E News* \* Apr 26-90. See also RAILROADS, culverts

**Cundy**, John *Inst C E* v 109 -92

**Cupola** furnaces. See BLAST furnaces; FOUNDRIES

**Curran**, Henry B., por. *E & Min* \* Dec 27-90

**Current** meter observations, Miss. river, report *F Inst* Apr -88

**Curve** ranger, Trotter's *Sc Am Sup* \* Jan 11-90 \* Dec 12-91, *Eng, The Eng*. See also INSTRUMENTS; SURVEYING

**Curves**, the false ellipse, Wurtele *Am C E* \* v 24 -91; the logarithmic, practical uses, Cox *E News* \* Aug 29-91; radii of curvature geometrically determined, MacCord (full) *Sc Am Sup* \* Jan 5-19 \* June 22 \* July 13 \* Aug 3-89 \* Jan 11 \* Oct 18-90, geomet. considered \* Dec 10-92, instruments for drawing \* Dec 28-89 \* Mar 29 \* July 12 \* Sep 20-90 \* Apr 4-91 \* May 14-92

**Cyclones**, whirlwinds *Sc Am Sup* \* Aug 11-88, *La Nature*. See also STORMS; WIND

**Cyclostyle** duplicating ap., com. report *F Inst* Apr -88

**Dady**, Jamsetjee N. *Inst C E* v 92 -88



**Daft**, Leo, por. *El Wld* \* Mar 30-89

**Dakota**, Black Hills, ore deposits, Carpenter (full) *Am Min* \* v 17-89

**Dams**, or high walls to resist the pressure of water, Francis, discuss., insets *Am C E* \* v 19-88

*E News* great, of world, inset \* Jan 7, 7; high masonry, theory of, Church, report \* 14, do., Fteley, Feb 4, 11, det. of profile, Morley \* Aug 11, Francis, an error of theory, ed. \* Nov 17, earthen, how to build \* 17, sluice gates \* 24, strains in, Flagg, cor. \* Dec 8, curved, Church \* 22-88; and reservoirs, state supervision of, ed. Aug 24, 24-89; earthen vs. masonry, Follett, Jan 2, 9; flow of thick sheets of water over, Herschel \* Nov 10-92

*E Rec* hillside protection, Mahan \* Dec 6-90; earth and masonry for irrig. works, Follett, May 14, 28; back water from, July 9; design of retaining walls, K. Allen, Nov 12 \* 19-92

*F Inst* compound dikes (stone), most econom. cross-section, d'Auria \* June -88; notable (Irrig. in India), Barois, *R & Eng* \* Dec -92; masonry, design and construction, Wegmann, bk. *The Eng* Oct 26-88; dangerous, Sep 13-89. See also CANALS; EARTHWORK; HARBOR eng; HOLLAND dikes; IRRIGATION, India; RIVERS; RESERVOIRS; WATER-works

ATHENS, Ga., Ledlie *E News* \* May 5-88

AUSTIN, Texas, Col. river *E News* \* July 11-91; Fanning, report, Frizell \* Sep 29-92

BEAR Valley, Cal. See DAMS, Sweetwater

BEETALOO water-works, So. Australia, concrete *Eng* \* July 3-91; Moncrieff *E News* \* May 30 \* Sep 19-91; *R & Eng* \* July -91; *The Eng* \* May 8-91

BETHEL, Ct., water-works, and filter bed, proposed *E News* \* Mar 7-91

BHATGARH *R & Eng* \* Aug -92

BLACK Eagle Falls, Great Falls, Mont., Parker, discuss., insets *Am C E* \* v 27-92; *E Rec* \* Oct 8-92

BOIRE river *E News* \* Apr 26-90

BUTTE City water-works, concrete masonry *E News* \* Dec 15, 22-92

CAMBRIDGE water-works, Mass., Stony Brook, Barbour *E Rec* \* Jan 5-89

CASTLEWOOD, Denver Water Storage Co. *E News* \* Mar 22-90



- Dams**, COFFER-dams and floating caissons, R. Hunt *E & Min* \* July 19, 26-90
- CONEMAUGH, Johnstown, Pa. *The Eng* \* June 21-89, *E Rec*
- CROTON water-works, N. Y., Convent ave. gate-house *E News* \* Sep 1, 15-88; inset \* Nov 15, 15-90; inset \* June 2-92; Fteley report *E Rec* \* Oct 18-90. See also DAMS, Quaker bridge, Sodom
- CURVED vs. straight, Bell *E News* Mar 31; strains in, Church, cor. \* Dec 1, cor. \* 28-88; cor. Aug 16; masonry, strains in, Martin, cor. Sep 27-90
- DAVIS Is. movable, Ohio river, Pitts., Pa. *Sc Am Sup* \* Aug 1-91
- DENVER, Col., Citizen's water Co., large, n *E News* Sep 20-90. See also DAMS, Castlewood
- ENGLISH, Sierra Co., Cal., destroyed *E News* \* July 6-89
- FOLSOM, Am. river, Cal. *E News* \* Oct 17-91, *R & Eng* \* July -92
- HOLYOKE, Mass., Whiting st. *E News* \* Sep 6-90
- KINGSTON's floating scouring *Eng* \* Oct 26-88
- KIRK wooden *E News* \* Apr 28-92
- LAWRENCE, Merrimac river, Hale *E Rec* \* May 4-89, *J Assoc E Socs*
- LUMBER, Penn., inset *E News* \* Sep 5-91
- MOVABLE, Pochet's (full) *Sc Am Sup* \* May 24-90, *Genie Civil*. See also DAMS, Davis Is.
- MUSKINGUM river *E Rec* \* Mar 8-90
- NEW Brunswick water-works, a dubious, Hill, cor. *E News* \* June 16, proposed \* 23-88
- NILE barrage *E News* Sep 27-90
- NORTHFIELD, Vt., a very bold arch *E News* \* Sep 20-90
- PAWTUCKET water-works, R. I. *E News* \* June 1-89
- PECOS river, N. M., rock fill *E News* \* May 17-90. See also DAMS, reservoir
- PERIYAR, Madras *Eng* \* Nov 25, inset \* Dec 9, construction *E Rec* \* Dec 31-92
- POTOMAC river, Wash. water-works, constructing, Chittenden, inset *Am C E* \* v 18 -88
- QUAKER bridge, Croton aqueduct. N. Y. water-works *E News* \* Feb 4, table, 11, design of, ed. 25, Marichal, cor. Mar 10; report and ed., inset \* Nov 3, 3-88; Fteley, Oct 11-90; map *E Rec* \* Oct 6; report *R Gaz* \* Oct 12, 26; Tratman *The Eng* Jan 27, Apr 20, Nov 30-88. See also DAMS, Croton



- Dams, RESERVOIR**, safety of, Kresnik *E & Min* \* Mar 1-90, *Inst C E*; rock fill, ed. *E News* July 28, Aug 11, and Schuyler, cor. Sep 22-88; and Conn. law, ed. Aug 24-89; European, Kresnik, Mar 15; Apr 12; measures for safety of, do. May 10; and embankments for water-works, inset \* June 21-90.  
See also RESERVOIRS; WATER-works
- SODOM, Croton, N. Y. water-works, n *E News* \* Dec 1-88; Oct 25-90; *Sc Am Sup* \* Jan 5-89
- SOUTH Fork reservoir failure, cause, com. report, discuss. (very full), insets *Am C E* \* v 24 -91; *Eng* \* June 7-89; and Johnstown disaster *E News* \* June 15-89; com. report *E Rec* \* Aug 29 \* Sep 5-19-91
- SWEETWATER, San Diego Bay, construction, Schuyler, discuss., insets *Am C E* \* v 19 -88; and Bear Valley, do. *E News* \* Apr 7, F. Brown (Redlands, Cal.) \* June 23, Schuyler \* Oct 27-88; Nov 23, 30-89; Schuyler, abs. *Inst C E* v 97-89
- TANSA, Bombay water-works, inset *Eng* \* Apr 29; *E News* \* June 30-92; *E Rec* \* Dec 19-91
- VYRNWY lake masonry, Liverpool water-works *E News* Dec 29-88; and ed. \* Aug 18-92; *R & Eng* \* Jan -89, *Industries; The Eng* \* June 27-90
- WALNUT GROVE, Ariz., disaster *E & Min* \* Mar 1-90; *E News* Sep 22 \* Oct 20, Nov 3-88; \* Mar 8-90
- WATER-works, of U. S., (list) *E News* June 15-89. See also RESERVOIRS; WATER-works
- WESTPHALIA, Verse river, proposed, inset *The Eng* \* Feb 1, 8 -89
- Daniel**, John, por. *E & Min* \* Feb 28-91
- Davenport**, Thomas, (inventor elec. motor), Pope, por. *El Eng* Jan 7; some cor. *El Wld* Apr 25; *St R J* \* Apr -91
- Davidson**, Robert, por. *El Wld* \* June 20-91
- Davy**, Humphrey *Eng* Jan 8-22, Feb 12-92
- Day**, David T., por. *E & Min* \* May 23-91
- Death**, Mitchell *Sc Am Sup* Oct 15-92, *Nat Sci*; origin of, Gardiner *Tech Q* July -91
- Dean**, John, por. *E & Min* \* Dec 20-90
- Debts**, county, of U. S., diagram *E News* \* Sep 6-90
- De Camp**, Edward F., por. *E & Min* \* Sep 12-91
- Decorticating machinery** *The Eng* \* Dec 27-89
- De Lamar**, J. R., por. *E & Min* \* Sep 5-91
- Delta** metal. *E News* July 26-90



**Denham**, Henry M. *Inst C E* v 91 -88

**Denny**, Robert *Inst C E* v 95 -89

**Denny**, William (ship builder) bk. n *Eng* Jan 25-89

**Dentistry**, mechanics of, Sweet *Cassier's* Nov -92

**Deserts**, Am. Sahara, 'Valley of Death' *Locom* Jan -91; great, of the earth, James (full) *Sc Am Sup* June 22-89

**Derricks**, hydr. and steam, Brown Bros. *Eng* \* Apr 18-90; stresses in, Elliott \* July 10-91; hydr. hoist, H. M. S. Vulcan \* Nov 18-92; derrick plant for Equit. building, Denver, Col. *E News* \* Aug 22-91; 15-ton. Butter Bros. *The Eng* Mar 2-88. See also CRANES

**Devonshire**, Duke of (W. Cavendish) *Inst C E* v 107 -92

**Diamond** mining and industry, etc., polishing *Eng* \* Feb 8-89; washing machinery \* Apr 25-90; Kimberley stats., So. Africa, Sep 4-91, report Dec 23-92, do., Stonestreet *E Mag* \* Aug -91, do. *E & Min* Sep 19, discov., Thorburn, Oct 24-91; Kimberley indus., Churchill, *Pop Sci* \* Aug -92; mines, Africa *Sc Am Sup* \* Aug 22-91; the De Beers mine *The Eng* Aug 17-88. See also GEMS

**Dibblee**, Frederick L. *Inst C E* v 97 -89

**Dick**, Charles *Inst C E* v 94 -88

**Dickinson**, George C. *Am C E* v 26 -92

**Dictionary**. See CENTURY dictionary

**Diet**, proper, for hot weather, Davies *Pop Sci* July -92

**Dikes**, Holland, notes, Starling, discuss., map, insets (very full) *Am C E* \* v 26-92, do. *R Gaz* Nov 11-92; compound (stone), most economical cross-section of, d'Auria *F Inst* \* June -88. See also CANALS; DAMS; RESERVOIRS; RIVERS, etc.

**Dirks**, Justus *Inst C E* v 92 -88

**Disasters**, in Aug., ed. *E News* Sep 8-88; great, earthquakes, floods, etc., ed. July 6-89. See also BRIDGE accidents; BOILER explosions; FLOODS; STEAMERS; RAILROADS, accidents, etc.

**Discoveries**, great, of past sixty years *Locom* Sep-Nov -89

**Disinfecting** ap., Koch, abs. *Inst C E* v 96 -89, \* *Bul Soc Mul* -88; *Sc Am Sup* \* June 30-88, *The Eng*

**Disintegrator**, the devil *Eng* \* Aug 10-88; trials *The Eng* \* June 27-90. See also CRUSHING, GRINDING

**Disk**, hollow cast iron, strains in, Leverich *Am C E* \* v 18-88

**Dividing** engine, 40,000 lines to the inch, Rowland *E News* Feb 18-88



**Diving boats** *Eng* Mar 15, Apr 5-89; Stove's diving dress \* Mar 28-90

**Dixon**, John *Eng* Feb 6-91, *Inst C E* v 104 -91

**Docks**, Auckland, N. Z., calliope graving, Swainson *Inst C E* v 101 -90

**BARRY**, works, J. Robinson *Eng* Apr 11-90, hydr. machinery and mode of tipping coal, discuss., insets *Inst C E* \* v 101 -90

**BOMBAY** graving, proposed *Eng* \* May 18-88

**BRISTOL** *The Eng* \* Oct 14-92

**BROADSIDE** dock slip, for ships *Sc Am Sup* \* Aug 8-91

**BROOKLYN** Navy Yard dry-dock, Simpson *Eng* \* Aug 22, *R & Eng* June -90

**CARDIFF** schemes, Bute dock, map *The Eng* \* Dec 9-92

**CHATHAM** *The Eng* \* July 24-91

**CUBA**, crib for Signa Iron Co. *E News* \* Apr 9-92

**DRY-docks**, of world *R & Eng* Aug -89; Wivenhoe *The Eng* \* Feb 21-90. See also DOCKS, names of places

**ESQUIMALT**, Brit. Columbia, inset *Eng* \* July 20, inset \* 27-88

**FLOATING**, and pontoon, Taylor *Eng* \* Aug 10, do. *Sc Am Sup*

\* July 7-88; offshore, Hamburg \* May 10-89, do. *The Eng* \*

Mar 11-92; Limerick, steel gates, Hall *E Rec* Apr 10-90, do. *Inst C E* v 97 -89

**GLASGOW** harbor *Eng* \* Aug 9-89; the Cessnock *E News* June 2-92

**GRAVING** *Eng* Nov 18-92, *Inst C E*. See also DOCKS, names of places

**HALIFAX**, Nova Scotia, graving *The Eng* \* Feb 28-90

**HAMBURG** floating offshore *Eng* \* May 10-89, *The Eng* \* Mar 11-92

**HAVRE** port dry-dock *E Rec* \* Dec 3-87, \* *Genie Civil*; Bellot dock, Desprez, abs. *Inst C E* v 101 -90, *An Ponts* \* v 17-89

**HULL**, Alexandra, Hurtzig *Eng* Feb 10, discuss., inset *Inst C E* \* v 92 -88

**INDIA**, East & West, arbitration *Eng* Dec 28-88

**LEAGUE** Island dry-dock *E News* \* Mar 14-91

**LIMERICK**, floating, gates, Hall *E Rec* Apr 10-90, *Inst C E* v 97 -89; failure of walls and methods for reconstruction, Hall, inset \* 103-91

**LIVERPOOL**, port and Mersey river, dredging *Eng* \* May 30 \* June 6; Lyster, Jan 17, extensions, discuss., insets (very full) *Inst C E* \* v 100 -90; Mersey estate *Inst M E* July -91



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**Docks**, MARE Island, Cal., dry-dock *E Rec* \* Feb 13-92

MARQUETTE, Mich., ore dock, Duluth, So. Shore & Atlan. R.  
*E & Min* \* Jan 10-24-91

NEW York dock walls *E Rec* \* Sep 3, Oct 1-92

PORTSMOUTH dockyard *Eng* July 29 \* Aug 5, 5, lifting ap., Corner, 26-92

PRESTON scheme, ed. *The Eng* June 29-88

PUGET Sound, Wash., U. S. Naval station, inset *E News* May 19-92

SAN Francisco dry-dock, hydr., Union Iron works *R Gaz* \* Nov 27-91

SOUTHAMPTON tidal *Eng* \* Sep 12, inset *The Eng* \* July 25-90

**Domestic** motive power by atmos. exhaustion, Dollfus, abs. *Inst C E* v 93-88, *Bul Soc Mul*-88; motors worked by rarefied air, Bourdenoot, abs. v 96-89, *Compt r* Feb 1-89

**Dolivo**-Dobrowolsky, Michael Von, por. *El Wld* \* Mar 19-92

**Dom** Pedro, ex-Emperor of Brazil *Inst C E* v 108-92

**Douglass**, Archibald Bryce - *The Eng* Apr 10-91

**Dovetails**, holding power of, Poe, report *E News* \* Dec 20-90

**Downes**, Charles C. *Inst C E* v 92-88

**Downing**, Samuel F. *Inst C E* v 109-92

**Drainage**, tables, G. Johnson *E News* May 5, 12-88; blunders, Webster *E Rec* \* Dec 10, 24-92; hints, Chandler *Tech Q* Dec-88. See also SEWERAGE

CHARLESTON, S. C., tidal *E News* Oct 25-90

CHICAGO, drainage canal *E News* \* June 2, 30-92; *E Rec* May 23-91

FENS and lowlands, by gravitation and steam power, Wheeler, bk., Spon, Lond. -88

HOUSE, domestic and water supply, Hartford *E Rec* \* Apr 2, 16-92; Chandler *Sc Am Sup* Jan 26-89, *Tech Q*

LOUGH Erne, Price, discuss., inset (full) *Inst C E* \* v 101-90

KANKAKEE marsh, Chic. canal *E News* \* Nov 3, 3-92

MEXICO, Valley of, Chism, map *E & Min* \* Dec 8, 15, 22-88, map *E News* \* Aug 10-89; City of Mex., hist. sketch, Noll *E Rec* Mar 16-89; Val. *Sc Am Sup* \* Aug 10, map *The Eng* \* June 28-89

WIESBADEN-Essen-Halle, abs. *Inst C E* v 96-89, *Deut Vier Ges*-89

**Draw-bridges**. See BRIDGES, draw-bridges



**Drawing**, section lining, standard, Van Vleck *Am M E* \* v 9-88; Holman *Cassier's* \* Sep -92; drawing-board, vertical *Eng* \* Jan 13, do. Vorth's *E News* Apr 7-88; section-liner and scale divider, Both's \* Oct 12-89; T square, Deane's adjustable \* Sep 13-90; essentials of mechanical drawing, Forney (very full) *R & Eng* \* Mar - \* Dec -90 \* Jan - \* Dec -91 \* Jan -92; as a means of education, Ablett *Sc Am Sup* July 7-88; simple method (artistic), Jacquot \* Mar 29-90. See also INSTRUMENTS, curve rule

**Dredge**, James, Wiley, por. *Cassier's* \* Feb -92

**Dredgers** and excavators, Panama canal, Williams, insets *Am C E* \* v 19-88; steam excavs., Clements *Am M E* v 9-88; Bennett elec. and amalgamator *El Rev* \* May 23-91

*Eng* double-ladder, Swansea harbor, inset \* July 13; frictional gear for, Griffith \* Aug 24; 'Kuphus' hopper, Bombay Port, inset \* Dec 7-88; hopper suction 'Libana,' Port of Libau, inset \* Jan 11; shore delivery for lake Copais \* Feb 1; dredging cost, Apr 26-89; sand pumping, Mersey bar, ed. Apr 11, and docks \* May 30 \* June 6; Cockburn crane and grab \* Oct 3-90; for excav. gold-bearing river beds \* Jan 9; steam crane excav., Weser river imp. works \* 16; dredging and amalgam. plant, inset \* Mar 27; Manchester canal soil transporter, inset \* July 24-91; floating elevator, transformation \* Aug 19; Jupiter twin screw suction pump \* Sep 30-92

*E News* Panama canal plant \* Aug 18, 25; French suction, Vernandon \* Nov 10-88; English, cost of, May 11; Lobnitz rock \* Jan 26, work of \* Oct 19-89; German stone \* Aug 16-90; Man. canal soil transporter, Sep 5-91; ap. for N. Y. harbor, Edwards, inset \* Mar 19; the Booth pump \* 26; trestle filling, N. Or. & N. E. R. \* Aug 4; dredging on Pac. coast, Miller, 4 \* 11-92; Lobnitz rock, removal under water without explosives *E Rec* \* Oct 12-89; four-screw hopper, Walker \* Feb 13-92, do. inset *Inst C E* \* v 107-92; the von Schmidt, Higgins, inset \* v 104-91; hydr., N. Y. harbor *R Gaz* Aug 28-91; Jandin's hydro-pneu, jointed conduit *Sc Am Sup* \* Mar 9-89

*The Eng* dredging machinery, subaqueous rock, Suez canal, Mar 9; combined traction engine, crane and excav. 30; hopper, Glasgow exhib. Sep 7, 7-88; Wilson's single chain grab \* Nov 28-90; hopper, for New So. Wales, inset \* Apr 8; sand pump, Thyboron, inset \* Sep 16-92. See also under CANALS; HAR-BOR eng.



**Drexel** Institute, Phila., Depew *E Mag* Feb -92

**Drifting** tests, autographic, Goodman *Inst C E* \* v 92-88

**Drills** and drilling, electric mining *El Wld* \* Dec 12; Simplex twist-drill grinder *Eng* \* Nov 6-91; Ingersoll-Sergeant, air valve *E News* \* Sep 27-90; Ainly-Oakes square hole drilling machinery, inset \* June 20, inset \* 27; Edison elec. percussion, May 16-91 \* Aug 25; Schuttler contin. acting ratchet \* Oct 6-92; rock, trials, Carbutt, insets (full) *Inst M E* \* Mar; Hawksworth stay-bolt *R Gas* \* May 29-91; Edmeston grinding machinery *The Eng* Apr 27-88. See also ROCK drills

**Driven** wells. See WELLS

**Dry-docks.** See DOCKS, dry-docks, etc.

**Drying** ap. in vacuo, Passburg *Eng* \* June 28-89, insets *Inst M E* \* May -89, *Sc Am Sup* \* Apr 19-90

**Dublin**, port and works, Griffith, insets *Inst M E* \* July -88

**Duluth**, Minn., sts., pavements, sewers and drainage *E News* \* Feb 14-91

**Duncan**, Louis, por. *El Wld* \* Apr 5-90

**Duncan**, Robert *The Eng* July 12-89

**Duncan**, Thomas *Inst C E* v 110-92

**Du Port** (Bey), William J. *Inst C E* v 108-91

**Duodecimals**, Halliday *The Eng* Mar 1-89

**Dust**, (means of excluding) and fresh air, Teale *Pop Sci* June -92; number of particles in atmos., Aitken *Sc Am Sup* Apr 7 -88; atmospheric, Marcet, June 21-90; spectroscopic properties, Liveing \* Feb 14-91; McPherson, Jan 2-92; Prinz dust collector *The Eng* May 11-88

**Dye-houses**, ventilation of *Locom* Dec -88

**Dyes** and dyeing, a revolution in dyeing, Chase *F Inst* Nov, Dec -90; and photographic printing, diatype proc., Carbutt, June -91; dyes, coal-tar or aniline *Chem Tr J*, *Sc Am Sup* May 9, fast and fugitive, Hummel (full) July 11, 18-91, Jan 30 -92, *Soc Arts Lond*; lactic acid and lactates in textile coloring, Norton *Tech Q* Nov -90. See also CHEMISTRY; COLORS; INDIGO, etc.

**Dyewood** extracts, notes, Siebold *Sc Am Sup* Aug 17-89

**Dynamics**, a question of, Dewey, ed. *E News* \* June 23-88; dynamic possibilities, ed. Sep 15-92; practical illustrations of, Greenhill *The Eng* Sep 13, 27 \* Oct 25 \* Nov 8, 22, Dec 6, 20, 27-89, problems in, Jan 31, solution, Apr 4; nomenclature com., Brit. Assoc. pro. Aug 15, 22-90; of gravity, Preston, cor.



**Dynamics**

Apr 10-**91**. See also PHYSICS, Dynamics, bk., Fessenden, Lond. -**92**

**Dynamite** shells, ed. *Eng* Nov 16-**88**. See also EXPLOSIVES; GUNNERY and armor

**Dynamometers**, transmitting, loss in by friction, S. Webber *Am M E* \* v 10-**89**; aut. absorption, Alden \* v 11 -**90**; belt dyn., Watt v 12 -**91**; measurement of power, Gray, variable speed power transmission, Spaulding \* v 13, 13 -**92**, *Iron Age* \* Dec 8-**92**

*Cassier's* power measurement, Gray \* June -**92**; Alteneck *El Eng* \* May -**88**; *El Rev Lond* \* Sep 23-**92**; the Trouvé *El Wld* \* July 19-**90**; Heinrich \* June 11-**92**

*Eng* friction brake, Beaumont, Nov 16-**88**, do. Brotherhood registering \* June 14-**89**; Amsler's recording \* Oct 24-**90**; a belt, Watt \* Sep 18-**91**

*E News* aut. absorption, Alden \* June 28-**90**; belt dyn., Watt \* June 20-**91**; measurement of power, Gray \* May 19-**92**; rough and ready, for small motors, Hoskin *F Inst* June **91**; friction brake, Beaumont, discuss. (full) *Inst C E* \* v 96-**89**; aut. registering *Sc Am Sup* \* Feb 9-**89**, \* *Industries*

*The Eng* Deprez registering, Feb 17; Smith's rotary transmission, May 11; friction brake, Newcastle engine trials, Anderson, Nov 9-**88**; Murray power transmission \* Nov 29-**89**

**Dynamos**, Dynamo-Machinery, S. P. Thompson, bk., Spon, Lond. '88

*El Eng* machines, theory, Hopkinson \* Jan, diseases, S. P. Thompson, Jan -**88**; shunt wound, influence of position of commutation on output of, Martin \* Dec 31-**90**; design, Reid \* Feb 4, 11-**91**; management, Crocker, Wheeler \* Jan 13, 20 \* Feb 3-17 \* Mar 9, 16, 30, Apr 27 \* May 11, 18; design, Loomis, Mar 16; machinery, theoret. elements, Kennelly \* Apr 20, 27 \* May 4, 18, 25, June 15, Nov 30, Hopkinson \* May 11; genesis, Pacinotti, por. \* Sep 21, 28 \* Oct 5, 12-**92**

*El Rev Lond* machines, synthetic study (full) \* Aug 3, 10, 24, Sep 7, 21 \* Oct 5, 19 \* Nov 2, 16, 23 \* Dec 7, 21-**88** \* Jan 11, 25, Feb 15 \* Mar 1, 15 \* Apr 5, 19 \* July 5, 19 \* Sep 6 \* Oct 4-**89** \* Jan 31 \* Feb 14 \* Apr 4, May 2, 16, June 6 \* July 11, Aug 22, Sep 26, Nov 7, Dec 26-**90**; Paris exhib. \* July 12, 26 \* Aug 2, 9, 23 \* Sep 6, 13 \* Oct 11-**89**; machines, Minet, Feb 7, 14; and motor design, Esson \* 28 \* Mar 7, 14-**90**; Blackburn



**Dynamos**

\* Jan 30 \* Feb 6; choice of a dynamo, considerations, Roberts, Oct 30, Nov 6; Frankfort exhib. \* Oct \* Nov \* Dec -91; machinery, Hopkinson \* Apr 15; waste field of, expts., Puffer \* 15; relative weights and costs, Snell \* May 20; calcs. and designing chart, do. \* June 3-92

*El Rev Knowles* \* July 20-89; machines and motors imps., Swinburne \* Apr 19; control of and coupling, do. Sep 6, 13-90, *Industries*

*El Wld* and motors, cal. and designing, Crocker \* Apr 28; machines construction, Poole, June 30; and motors designing, Owens \* Nov 17-88; machines, Hillairet, Sep 7-89; and motor design, Esson (full) \* Mar 22, 29 \* Apr 5, 12; best speed, Rechniewski \* Sep 13, new forms, Wadsworth \* 13-90; choice of a dynamo, Roberts, Oct 17-91; and motors, magnetic leakage, Ives (full) \* Jan 2; effc. determinations, Kapp \* Feb 20; dynamo-elec. machinery, Hopkinson, Wilson \* Apr 30; relative costs and wts., Hering \* 30; and motor cal., Bedell, diag. \* 30; heat radiation from, Rechniewski, May 14; relative wts. and cost, Snell \* June 25; effc. diag., Hering \* Aug 13; designing, Picou, Nov 5-92

*Eng Paris* exhib. \* Sep 6; Desrosier, do. \* Oct 18-89; early \* July 10-91; and motor cal., Bedell, inset *F Inst* \* June -92; 1000 h.p. steam, Berlin Cen. elec. light station, Uppenborn, abs. *Inst C E* v 100 -90, *Elek Zeit* v 5 -90; Cail Soc. abs. *Inst C E* v 106-91, \* *Genie Civil* v 19 -91; designing, Hobart *Pwr* \* Oct \* Nov -89 \* Feb - \* Apr \* June - \* Sep -90 \* Feb, Mar -91; development, Fairchild \* Apr \* May -90; losses in, Hobart \* May -91; diseases of, S. P. Thompson *Sc Am Sup* Jan 7-88; waste field of, experimental study, Puffer *Tech Q* \* Oct -91; speculations on electro-magnetism, Fritsche *The Eng* \* June 21; Alioth, Paris exhib. July 12-89. See also ELECTRIC generators — motors

ACCESSORIES, dynamo room, for resist. measurements, etc., Has-kins *El Rev Lond* \* Sep 6 *El Rev* \* Aug 17 *El Wld* \* 17-89

ADMIRALTY specifications *El Rev* May 3-90

AIR gap, relation of, and shape of poles to performance of, Ryan *El Eng* \* Sep 30 \* Oct 7, (full) *El Rev* \* Oct 3, (full) *El Wld* \* Oct 3-91

ALTERNATING current, arc, analyzing magnetic reactions of arm-atures, Reid *El Eng* \* Nov 5; Stanley arc, Tobey \* Nov 5, do.



**Dynamos, ALTERNATING**

- investigation (full) *El Rev* \* Nov 8, do. *El Wld* \* Nov 8-90; Kennedy *El Rev Lond* \* June 1-15, 29-88; \* May 17-89; curves showing performance, Lewis *El Wld* \* Nov 14-91; machinery, Kapp *Eng* Feb 22, May 31-89, do. and discuss. (full) *Inst C E* \* v 97-89; generators and receivers, Anthony *Soc Arts Mass* -88
- AMPERE-foot table for cal., and motor windings, Serrell *El Eng* Dec 10-90
- ARC, open coil, M. E. Thompson *El Eng* \* May 27, (full) *El Rev Lond* \* June 19, *El Rev* \* June 6, discuss. 13, *El Wld* \* May 30-91. See also DYNAMOS, alt. current
- ARMATURE reactions and motors, theory, Swinburne *El Rev Lond* \* Feb 14, 21, discuss. Mar 28, Apr 4, *El Rev* \* Mar 15-90; ring, relative proportions of, Dobbie *El Wld* \* Jan 26; methods to determine equiv. area of, Ferry, Aug 31-89; reaction in constant current, Carhart (full) \* June 6; reactions, Wagner \* Aug 22-91, *Technic*
- BALL, manuf., Collins *El Eng* \* Nov 30-92
- BROWN'S, transmiss. of power by *Eng* \* Apr 20-88
- BRUSH alt. current system *El Eng* \* Aug, *El Rev* \* July 13; arc, effc. etc., Melbourne exhib. lighting, Murray *El Rev Lond* Nov 15-29-89
- COMPOUND winding, theory of for constant poten., Bell *El Eng* Nov 26, *El Rev* \* Nov 29-90; patents (full) *El Rev Lond* Nov 30, Dec 7-28-88, Mar 1-15, May 31, June 7, 14, July 5-89, machines, July 25-90
- CONTINUOUS current machines design, Jamieson (full) *El Rev Lond* \* Mar 8-89, *Inst C E*
- DESROZIER'S disk-dynamo, Meylan, abs. *Inst C E* v 95-89, *Lum Elec* v 29-88
- EVANS friction cone direct driving system (theory) *El Eng* \* Mar 25-91; *El Rev* \* Sep 14, belt *El Wld* \* Sep 14-89
- EDISON, and motor *El Rev Lond* \* Aug 21-91; *Sc Am Sup* \* Mar 5-92; Paris exhib. *The Eng* \* Nov 15-89
- EICKEMEYER'S *El Eng* \* Mar -88
- FERRANTI system, Haskins *El Rev* Feb 28-91; 10,000- light, Grosvenor gallery, Lond. *Sc Am Sup* \* Dec 15-88; *The Eng* \* Nov 1-89
- FIELD-magnet coils for, Kapp *El Wld* May 3-90
- FRITSCHÉ wheel *El Rev* \* Apr 6, n *Sc Am Sup* \* Apr 20-89



**DYNAMOS**, GANZ contin. current, Delta type *El Rev Lond* \* Dec 14-88; alt. machine and transformer, Forbes *El Wld* \* May 25-89

GOOLDEN-Willans combination, tests *El Wld* \* Dec 6-90, *Elec-trician Lond*

HOCHHAUSEN arc light machine *El Eng* \* Apr 23-90

LEAKAGE, magnetic, and motors, Ives *El Rev Lond* \* Jan 22, 29-92, *El Wld*

LEEDS, the *The Eng* May 25-88

MORDEY alt. current *Eng* \* June 1-88

MULTIPOLAR, low speed, for contin. currents, Perret *El Eng* \* Nov 26, do. *El Rev* \* Nov 29, do. *El Wld* \* Nov 29; Riker low speed contin. current, and motors \* Dec 17-90; at Frankfort exhib., Kolben \* Nov 25 \* Dec 2; design, Esson \* May 6, 20, do. *El Rev Lond* \* Apr 10, 24, May 1, do. *El Rev* \* May 16, do. *El Wld* \* May 2, 9, 23-91; *Pwr* \* Dec -92

OERLIKON three phase alt. current *El Rev Lond* \* Aug 28-91

PERRET, and motors, building (full) *El Eng* \* Jan 6-92; and motor *El Wld* \* Feb 2, July 6 \* Aug 3-89. See also DYNAMOS, multipolar

PLATING, Hopkin's *Sc Am Sup* \* Mar 14-91

PYKE & Harris alt. current *El Rev Lond* \* May 6, 13-92

PYLE aut. steam engine and (multiple cyl.) n *El Wld* \* Aug 29-91

REGULATION, arc or constant current, Tischendorfer *El Eng* \* July 1-91; by means of a third brush, Caldwell (full) \* Dec -88, (full) *El Rev Lond* Jan 4-89; alt. current regulating, Lowrie \* Sep 28-88; current reg. decision, T. H. vs. Citizen's Elec. L. Co. *El Wld* Sep 1-88; Lahmeyer's system, Paget \* Oct 12-89; reg. of constant current, Dow \* Apr 11-91

RING, the, Paris exhib. *The Eng* \* Aug 9-89

SAUTTER-Lemonnier's duplex *The Eng* \* Oct 25-89

SCIENTIFIC American, the *El Rev Lond* \* Aug 5, *Sc Am Sup* \* July 30-92

SERIES, loss in armature of, Opitz *El Eng* \* Aug -89

SPARKING and flashing of, M'Berty (full) *El Rev* \* May 28-92.

See also ELECTRIC sparking

STEINLEN, the *The Eng* \* Oct 18-89

STURGEON's early *El Wld* \* Aug 1-91

TESLA unipolar *El Eng* \* Sep 2-91

THOMSON's *El Rev Lond* \* Aug 15-90; and lighting ap. manuf.,



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- Thomson-Houston works, Lynn, Mass. *E News* \* June 30, July 7, 14-88
- THURY, the *The Eng* July 19-89
- WADDELL-Entz, and motors *El Eng* \* Dec 30-91
- WESTINGHOUSE, expt. determination of law of variation of elec. mo. force in armature, Searing *El Rev Lond* \* Aug 30, do. *F Inst* \* Aug; *Eng* \* Jan 18-89
- WESTMINSTER, the *El Wld* \* May 18-89
- WILLSON'S 1000 h.p. *El Rev* \* July 4 (large) electroplating *El Wld* \* July 4-91
- WIRES sizes, table *El Rev Lond* Nov 16-88
- Dyson, George *Inst C E* v 106 -91

**Eagles, Thomas H. *Inst C E* v 110 -92****Earth**, polarization of the, by heavy currents, Cuttriss *El Eng* \* Sep 3-90; elec. conductivity, Appleyard *El Rev Lond* \* Mar 11-92; Seismograph (instrument), Gray-Milne *El Rev* \* Jan 21-88; elec. disturbances from elec. lighting, Preece \* Apr 27-89

*Eng* model of, Paris exhib. June 28, do. *E News* July 13-89; earth's crust, percentage composition of, F. Clark, June 28-90; handling earth, unloading from cars \* Apr 18-91 \* Oct 6-92

*F Inst* how measured, Gore, Nov, Dec -92; influence of rotation on moving bodies (railroad train), Bavier, abs. *Inst C E* v 99 -90, *Zeit deut Ing* -89; how long can the earth sustain life, Littell's, June 11-92; measuring the earth *Locom* May -89; theories, Feb -90; population, Feb, *Pop Sci* Jan -92

*Sc Am Sup* earth, as seen from the heavens, Aug 18-88; age of, d'Assier, Mar 2-89; not a vast cemetery, Prime (cals.) Jan 18-90; earth removal by scrapers \* Apr 11-91, *Zeit Arch Hannover*; theory of, Geikie *Sc Am Sup* Sep 17, 24; age of, Hutchinson, Oct 15-92, *Knowledge*, d' Assier *Rev Sci*

**Earthenwares**, porous, Gilman (full) *Sc Am Sup* May 30-91.

See also STONEWARE.

**Earthquakes**, and magnetic phenomena, Milne *El Wld* \* Oct 11-90; Japan *Eng* \* Jan \* Feb 5-92; theory of, Falb *E News* July 14, 21-88. See also BUILDING, earthquake countries**Earthwork**, estimating overhaul in, by means of the profile of quantities, Fisher *E News* \* Jan 31; cal. overhaul for, Stanford, cor., comput. areas from cross-section notes \* Apr 18, 18-



**Earthwork**

**91** ; retaining walls design, K. Allen *E Rec* \* Oct 29 \* Nov 5-  
**92** ; calcs., Hurst's triangular prismatic formula, J. W. Smith  
*Inst C E* \* v 95 -**89**. See also DAMS ; FOUNDATIONS ; HAR-  
 BOR eng ; RESERVOIRS ; TUNNELING ; WATER-works

**Easten**, James *Inst C E* v 95 -**89**

**Edison**, Thomas A., inventions at Paris exhib., Hammer *El Wld*  
 \* Aug 31 \* Sep 7-28 \* Oct 5, 12 \* Nov 16-**89** ; life and inven-  
 tions, Dickson, por. *Cassier's* \* Nov \* Dec -**92** ; por. *E &*  
*Min* \* Oct 10-**91** ; por. *Sc Am Sup* \* Apr 19-**90**

**Education**, mechan., plea for the printing press in, Hawkins *Am*  
*M E* v 8 -**88** ; technical, Egleston, Pres. addr. *Am Min* v 16-  
**88** ; technical elec., Owens *El Rev* July 9, electro-technical do.  
*El Wld* June 18, Jackson, 18, discuss. 25-**92** ; technical, ed. *Eng*  
 Jan 24-**90** ; eng. schools *E News* files, July- Dec, etc. -**92** ;  
 value, and drawing and hand work in pub. schools Canbes  
*F Inst* Sep -**89** ; nat. hist. in elementary schools, Hensoldt, Jan  
 -**90** ; of the future, C. King *Forum* Mar -**92** ; eng. education  
 in Brit. Dominions (bk.) *Inst C E* -**91** ; of the steam engineer  
 (list of studies) *Pwr* Jan -**91** ; manual, or industrial training,  
 Taube *Pop Sci* July -**88** ; scientific method in, W. Mills \* Nov  
 - **92** ; technical, Armstrong *R & Eng* Sep -**88**, 19th Cent. ;  
 industrial, Pratt Inst., Brooklyn *Sci Am* Oct 6-**88** ; technical,  
 Galbraith *Sc Am Sup* Apr 23 ; the new, Thurston, July 30-  
**92** ; Atkinson *Tech Q* May -**90** ; scientific and technical  
 schools, place of in Am. education, Walker, Dec -**91** ; techni-  
 cal, R. H. Smith *The Eng* Feb 12, 19, Mar 11-**92**. See also  
 MANUAL training ; SCHOOLS

**Egypt**, the redemption of *E & Min* Apr 11-**91** ; land reclama-  
 tion in *E News* May 12-**88** ; and Greece, ed. notes, Aug 23, 30  
 -**90** ; Egyptian monuments, how read, *Littell's* May 14-**92**.  
 See also IRRIG. in Egypt

**Eickemayer**, Rudolf, por. *El Eng* \* Dec 17-**90**, por. *El Rev* \*  
 July 9-**92**

**Eiffel**, Gustavo, por. *Sc Am Sup* \* June 15-**89**

**Ejector** and its work, Hiscox *E Rec* \* Nov 19-**92**. See also  
 INJECTOR

**Elder**, John, statue *Eng* \* July 27, do. *Sc Am Sup* \* Sep 1-**88**

**Electrical** arcadia, Johnson *El Wld* Mar 28-**91** ; future develop-  
 ment, E. Thomson *N E Mag* July -**92**. See also under ELEC-  
 TRIC eng.



**Electric engineering**, mod. theories, review, Anthony *El Eng* Feb -90; elec. science, see Brit. Assoc. pro. *El Rev Lond* Sep -88; industries prog. Jan 2, 9, 23, 30; science, Crookes' addr. (full) \* Jan 16, 23, Varley, 23, Feb 6; prog. July 3, 10-91

*El Rev* development, Preece, Brit. Assoc. Oct 13-88; prog., '88 \* Jan 5-89, Feb 20, '92, Dec 31-92; possibilities, Madden, June 15-89; theories review, Anthony, Feb 1-90; mod. uses, Parker \* Jan 31, Weyde \* Feb 21-91

*El Wld* prog., '87, Wetzler, Jan 14-88, (review of half year) June 28, of '90, review, pors. \* Dec 27-90, of '91, Dec 26-91, do. Houston, June 11, needs of the times, Watts, Dec 3, 17-92; trans-atlantic trip notes, Lockwood (full) Oct 26-89; theories review, Anthony, Feb 1, discuss. \* 8; improvements, prodigality in economy, Haskins, Mar 15-90; European practice, Hering (full) \* Sep 19, 26 \* Oct 3, 24-91

*Eng* plant, Paris exhib., Oerlikon, July 26-89; possibilities of, W. Crookes (suggestive) *Littell's* Apr 9-92, *Fortnightly Rev*; discovery, the latest, Tesla, Gordon *Littell's* Apr 30-92, *19th Cent*; future development, E. Thomson *N E Mag* July -92; prog. in '88 *Sci Am* Feb 9-89; eng. in Am., Addenbrooke *Sc Am Sup* Feb 15-90; possibilities, Crookes, Mar 12-92; eng., Paris exhib. *The Eng* \* Aug 9, 16 \* Oct 4-18 \* Nov 1, 15, 22; eng. in U. S., Addenbrooke, Dec 20-89. See also ELECTRICITY; ELECTRO-

**ACCUMULATORS**. See STORAGE batteries

**ACTION**, theories review, Carhart *El Eng* Sep, *El Rev Lond* Sep 27, *F Inst* Nov, *Sc Am Sup* Oct 12-89; due to an intervening medium, Fitzgerald, Oct 6-88

**AGING** of spirits, Stauffer *El Rev* \* Mar 26-92

**AGRICULTURE**, in, cost, ed. *El Eng* May 11-92

**ALTERNATING** currents. See ELEC. currents, alternating

**ALTERNATORS** coupling in series, Boucherot *El Wld* \* Dec 27-90

**ALUMINUM**, elec. production of, Farmer, discuss. *El Rev* Jan 13-91. See also ALUMINUM

**AMMETER**, the Wood *Sc Am Sup* \* Jan 14-88. See also ELEC. meters

**AMPERE** and volt meter, Sankey *El Rev Lond* \* Nov 27, Dec 4-91. See also ELEC. meters

**APPARATUS**, appliances, Canadian, Lawson (full) *El Rev Lond* July 4-90; ap., Pitts. bureau of electricity *El Rev* July 4-91;



**Electric APPARATUS**

Siemens Bros' *Eng* \* July 8, 15 \* Aug 5, 19, 26 \* Sep 2-16-92.  
See also DYNAMOS, room appliances; RAILROADS, elec. power stations appliances

ARC, photographic study of, Nichols *El Eng* \* May 27, *El Wld* \* May 30, E. Thomson, discuss. June 6, *El Rev* \* June 6, discuss. 13, alternating between a ball and point, expts. do. \* Jan 17, do. *El Rev Lond* \* Feb 6-91; light of, Trotter \* May 6, 13, discuss. 20; alt. currents expts., E. Wilson \* Dec 30-92; and use in lighting, E. Thomson (full) *El Rev* \* Feb 28-91; normal and hissing arcs, Cravath *El Wld* \* Mar 19-92; arc resistance and dynamo armature, Feussner, abs. *Inst C E* v 92 -88, *Central Elek* -88. See also ELEC. lamps, arc

BALANCE, W. Thomson's composite, Gray *Sc Am Sup* \* July 14 -88, *Industries*

BATTERIES, Paris exhib., Hering *El Eng* \* May 21 \* June 26-90; econ. in primary employed for generating power, Kennelly (full) Mar 30-92, do. *El Rev Lond* May 6-92; elec. mo. force of, Chronstchoff, Sitnikoff, June 28-89, *Compt r*; chem. generators, possibilities and limitations of, Crocker (full) *El Eng* June, *El Rev Lond* June 8, *El Wld* May 26; primary tests, Kennelly \* Sep 1-88; standard cell, Hering *F Inst* \* May -91; high power, Sprague, *Sc Am Sup* June 13-91. See also STORAGE batteries

BICHRIMATE, elec. mo. force of, Reynier, abs. *Inst C E* v 92, 92-88, *L'Electrician* -87-88; for domestic elec. lighting *Sc Am Sup* \* Mar 23-89, *Genie Civil*

CLARK cells, causes of variation, Swinburne *El Rev Lond* Aug 28-91; Kahle, Aug 26-92; setting up *El Wld* \* June 7 -90

D'INFREVILLE wasteless gravity zinc *El Eng* \* Aug 24; three steps in invention of most constant and economical *El Rev* \* Sep 10-92

EDISON-Lalande *El Eng* \* Apr 2-90, *Sc Am Sup* \* Mar 7-91  
GALVANIC, notes, Land *El Wld* Mar 15, 22-90; practical value of, expts., Sosnovsky, abs. *Inst C E* v 98 -89, *Jurn Min Soob* -89

GAS, Scharf *El Rev Lond* \* Jan 10, do. *Sc Am Sup* \* Feb 22, *Zeit Elek*; Ludwig *El Rev* Sep 20-90

HELLESEN's dry elements *El Rev Lond* Feb 6-91

LIGHT *Sc Am Sup* \* May 31-90



- Electric BATTERIES, LIGHTING, problem of heat cells, Scheible**  
*El Wld* June 14-90
- MINIATURE, Farnham, n** *The Eng* \* Mar 29-89, *El Wld*  
 O'KEENAN primary and applic. to domestic elec. lighting, Shed-  
 lock *El Wld* \* July 7-88
- OXIDE of copper, Lalande** *El Rev Lond* \* June 19-91
- WEYMERSCH primary** *El Rev Lond* June 27, report *El Rev*  
 July 19-90
- BIBLIOGRAPHY, course of reading, Bell** *El Wld* Aug 8, 15-91
- BLOW-pipe and welding, Sheldon** *Sci Am* Feb 2-89
- BRAKES** *Eng* \* Dec 20-89
- BULLETIN board, news, Delany's** *El Wld* \* July 28-88; sport-  
 ing \* Jan 24-91
- CABLES, submarine, of world** *El Rev Lond* Feb 15-89, *J Telegr* ;  
 Waring's underground *Eng* \* Oct 19-88; rubber covering  
 machine *Sc Am Sup* \* Mar 15-90. See also ELEC. wires,  
 underground; TELEGRAPH cables
- CALCULATIONS, Sloane** *El Rev Lond* Apr 11-90
- CANADIAN Assoc., Wright, pors.** *El Wld* \* Feb 27-92
- CAPSTANS, Nansouty** *El Rev Lond* \* Nov 22-89
- CHRONOGRAPH, F. J. Smith** *Sc Am Sup* \* July 5-90
- CLASSIFICATION, World's Columb. exhib., U. S.** *El Rev* Mar 28  
 -91
- CLUB house, N. Y., pors.** *El Rev* \* Feb 4-88
- COMPANIES, BRUSH vs. Julien, legal decision** *El Eng* Apr 2-90;  
 Anglo-Am. *El Rev Lond* July 19, 26, Aug 16-89, legal decision,  
 June 6-27-90; 2d an. report, Oct 2-91
- EDISON, El Eng pat. suit in England (full)** June - Sep -88,  
 Westinghouse litigation, Nov -89; incand. lamp pat. annul-  
 ment in Canada, Apr -89, Jan; report, Feb; General Co.  
 report, Mar -90; incand. lamp literature (full) June 10-24,  
 July 1, 15, 22; Co's (full) \* Aug 12; incand. lamp vs. U. S.  
 Elec. Lighting Co., literature, (full) Dec 16, 23-91, Jan 13;  
 Edison feeder, models, etc. \* May 4, 18, 25, June 22, 29;  
 and Thomson-Houston consolidation, ed. Feb 10; Edison  
 General Elec. Co. report, 17; incand. lamp decision (full)  
 extra, Oct 4-92; Edison-Sawyer-Man incand. lamp case,  
 (full) June -89, Dec 14-92
- El Rev Lond* and Swan incand. lamp pats. (very full) Apr  
 20, 27, May 4-25, July 6, 20-88, Feb 22, Aug 2-89, Aug 1  
 -90; incand. lamp case in Am. June 26, July 3, 10, 24, Aug



**Electric COMPANIES, Edison**

14-91, rep. July 22, pat. hearing, Aug 5, Am. pat. decision, Oct 21-92

*El Rev* Edison vs. U. S. Elec. Lighting Co., decision, May 26-88; incand. lamp pats. in Canada, Mar 23; Illum. Co's pro. Aug 24-89; General Co. report, Jan 31; decision (very full) \* July 25, Aug 1-91; and Thomson-Houston consolidation, Feb 13; incand. lamp suit (full) May 7, filament pat. decision, July 2, decision, sup. Oct 8, ed. n 15, Dec 24-92

*El Wild* Edison works, Schenectady, N. Y. (full) sup. \* Aug 25-88; Canada decis. (full) Mar 23-89; Edison General Co. report, Jan 24; incand. lamp pat. suit, vs. U. S. Elec. L. Co., ed. (full) \* June 6, 13, 20, July 18-91; General Co. report, Feb 20; and Thomson-Houston consol. Feb 13; incand. lamp case, May 14, Dec 17, opinion, 24-92

*Eng* Edison, Paris, June 14-89; and lighting ap. manuf., Thomson-Houston works, Lynn, Mass. *E News* \* June 30, July 7, 14-88; incand. lamp pats. \* Apr 25-91, validity in Great Britain, decision *E Rec* Aug 4-88; Co's consolidations *Sci Am* Mar 2-89; incand. lamp pat. decision *Sc Am Sup* Aug 8-91; and Swan, legal trial *The Eng* July 20, decis. Dec 21-88

EDISON General Co. report *El Eng* Mar -90, Feb 17-92, *El Rev* Jan 31, *El Wild* Jan 24-91, Feb 20-92

GENERAL, Edison and Thomson-Houston consolidation, ed. *El Eng* Feb 10, *El Rev* Feb 13, *El Wild* Feb 13; organization, pors. \* May 14-92

SWAN United Co. *El Rev Lond* June 8-88; and Edison, Aug 2-89, Aug 1-90, July 22, pat. hearing, Aug 5; report Dec 2-92; and Edison, legal decis. *The Eng* Dec 21-88

THOMSON-HOUSTON Co. report *El Eng* Apr 30-90, Apr 22-91, do. (full) *El Rev* Apr 18-91; and Edison consolidation *El Eng* Feb 10, *El Rev* 13, *El Wild* 13; General Co. organization, pors. \* May 14; report, Apr 10, *El Rev Lond* Apr 29; works, Lynn, Shaw, plan (full) *El Eng* \* June 29, do. *St R J* \* Aug \* Sep -92. See also ELEC. Co's. General

WESTINGHOUSE, Edison litigation *El Eng* June, Nov -89; works, Pitts., Wetzler (full) \* Oct 19-92; Co. report *El Rev* July 19-90; circular, May 16-91; report, May 28-92; shops, overhead cranes in *R Gas* \* July 19-89



**Electric** CONDENSERS, history, development and applics., Maver *El Eng* \* Jan -89; oscils. in charging of, Robb *El Rev Lond* \* Dec 16; spark and air jet expts., E. Thomson \* Mar 25, *El Eng* Feb 17, *El Wld* \* Feb 27-92; influence on disruptive discharges, Acheson *El Rev Lond* \* Aug 10 \* Sep 28, cor. *El Rev* July 7-88; eccen. cylinders problem, Kennelly *El Wld* \* Nov 26; future in elec. lighting, Swinburne \* Jan 9, 16-92, *Industries*

CONDUCTORS, anti-effective cop. in parallel or coiled, for alt. currents, W. Thomson *El Wld* \* Sep 27, *El Eng* \* Sep 24-90; insulated, Bowstead, Mar 16-80, Apr 6, 13, do. Williams, Aug 17, 31, Nov 30-92; absolute vacuum as a non-conductor, Weyde *El Rev* \* Dec 22, *El Wld* \* Dec 22-88 *Sc Am Sup* Jan 19, *El Rev Lond* Jan 11; size cal., Kempe, May 24-89; electrostatic force between, Lodge (full) Oct 10; econ. in, Kilgour, Dec 12, 19-90; insulated, spec., Preece, Dec 11, 18-91; heating of by elec. currents, Kennelly *El Wld* \* Nov 28, diags. 30 \* Dec 7, 14-89; law of economy, Santarelli, July 26, Aug 2; econ. in, Kilgour, Dec 27-90; most econom. loss, Roberts, July 18, 25, Aug 29-91; relation between rise of temp. and current, Wadsworth \* Feb 27 \* Mar 12; molecular movement in, Dolbear \* Apr 9-92

CONDUITS, Chenoweth's, com. report *F Inst* Sept -89; elec. system, Harding *El Rev* \* Dec 6-90; elec., Interior and Insulation Co. system, com. report, Johnson \* Mar -91

CONGRESS, Paris internat. '89 *El Eng* Nov, Dec -89, *Industries*, (full) *El Rev Lond* Sep 6-27, Oct 4, *Eng* Sep 6-27-89; Frankfort internat. Sep 18, 25-91

CONSTANT shunt method, errors in, Puffer *Tech Q* Feb -88

CONSTRUCTION Co., Bushbury, England *The Eng* Nov 27-91

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*El Wld* max. effic., Howell \* Apr 14, 28; (wiring) leads, table, July 14-88; relation between initial and av. effic., Peirce (full) \* June 8; fits. from and effic., Reed \* Nov 30, shape and size do. discuss., Dec 14-89; Berrenberg's vac. pump \* Apr 26; life of, table, May 3; Edison special, Jackson, Sep 27-90; highest econ., Leonard, Apr 18; Grier, 25-91; Ries' regulating socket \* Mar 19; curves and wire calcs. without tables, Roberts \* July 2; life and effic. test, Thomas (full) \* 16, do. Gossler (full) \* Sep 17; age-coating in, Nichols \* Nov 12; pats., separable or detachable, Böhm \* Dec 3; advantages of forcing at expiration of their life, Hering \* 24; life and effic. tests, Feldmann \* 17-92, *Electric Lond*

*Eng* glow lamp pats., ed. July 20-88; deterioration of, ed. Jan 23-91; glow lamps, max. effic. Howell, abs. *Inst C E v* 93-88, *El Eng*; and arc, probs. in the physics of, Fleming *Sc Am Sup* \* Aug 23-90; data and testing, Puffer (full) *Tech Q* \* Feb, insets \* May-90; candle power relative to voltage, Ferguson, insets \* July-91

PORTABLE, Friedlander's *The Eng* June 1-88

LAUNCHES, Reckenzaun (full) *El Eng* Aug 13-90; on the Thames river, Forbes *El Wld* Oct 5-89; *E News* Aug 23-90. See also LAUNCHES

LIGHT, car, Penn. R., inset *E News* \* Aug 23-90; and power long dist. transmission, Scott *El Eng* \* June 15; lights, photometric study of, Genung *El Rev Lond* \* Dec 16 *El Wld* \* May 28-92; signals, Conz incand. system *The Eng* July 6-88. See also ELEC. Lighting

LIGHTING, from financial standpoint, Wiman *Cassier's* Apr -92; dangers, Edison *El Eng* Dec -89, Jan -90; in railroad service, Leonard, July 9, do. *E News* July 12-90

*El Rev Lond* Fontaine, Sep 27-89; standard specs. July 4; sanitary aspects, Preece, Aug 29; in its relation to the consumer, Naylor, Dec 5-90; mains, Preece, May 22; nine years' record, Bd. of Trade report, Aug 14-91; English stats., table, Jan 8; figures, Booth \* Apr 1, 8, 22 \* May 27, June 17-92

*El Rev* convention, Pitts. (full) Feb 25-88; hazards, Has



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kins, Oct 5-89; in the tropics, Fleming, May 31; superior to gas, Hoho, Oct 25-90; cost, table, com. rep. Feb 28-91

*El Wld* by storage bats., cost, Oct 18-90; data, com. rep., table, Feb 28; prices, July 4; relation to optical science, Boyle (full) \* Nov 14-91; from finan. standpoint, Wiman, Mar 5; supply cost, Hopkinson, Dec 3, 10, 24; photometric study of, Genung \* May 28, do. *El Rev Lond* \* Dec 18-92

*Eng* central station, Crompton (cost, etc.) Apr 20-88; cost, ed. Nov 11-92; artesian well plant *E News* \* Sep 29-88; cost of, various cities, n Oct 5, 12-89, Jan 25; Kansas City, June 28; candle power, Kingman, cor. 28-90; Geipel *Inst M E* Feb -88; and working, Preece *Sc Am Sup* June 2, 23; in Am., Forbes (full) Oct 27-88; Fontaine report, Nov 16-89; cost *The Eng* Mar 11-92

ACCESSORIES, English and Am. differences, Bathurst *El Wld* July 26-90

ANNAPOLIS, Md. station *El Wld* \* July 27-89

APPARATUS, rules for *E Rec* Aug 16-90

ARC, Westinghouse alt. system *El Eng* \* Apr 2; cost, various towns and cities, Rosewater, 9-90; use of arc in, E. Thomson (full) \* Feb 25; rates, various cities, Apr 1-91, cost do. *El Rev Lond* Dec 13-89; E. Thomson, Mar 20 \* 27, Apr 3 -91; cost from small power stations, Sep 30-92; cost various (38) Am. cities, table *El Rev* Mar 26-92; the Huntington arc projector *El Wld* \* Dec 7-89; station, St. Louis (largest in world) report (full) Jan 8; use of arc in, E. Thomson (full) \* Feb 28; 'Munic.' St. Louis system, Ayer, Sep 19-91; Westinghouse system, abs. *Inst C E v* 101 -90 \* *El Eng N. Y.* -90; cost, various cities *Sc Am Sup* Dec 14-89

ASHTON Court station, England *The Eng* \* Dec 11, 11-91

ASSOC., Nat. pro. (full) *El Eng* Sep -88, Sep -89, (full) Mar, Mar, Aug 27-90, Feb 25, Montreal (full) Sep 16-91, Huntley addr. Mar 2-92, (full) *El Rev* Sep 8-88, (full) Mar 2, Niag. Falls, Aug 17-89, (full) Feb 22, Aug 30-90, (very full) Feb 28, Montreal, pors. \* Sep 5, 19-91, pors. \* Feb 20, (full) Mar 5-92, (full) *El Wld* Mar 3, Sep 8-88, (full) Mar 2, Aug 17-89, Kansas C. (very full) Feb 22, pors. \* Aug 30-90, Pres. addr. (full) Feb 28, Montreal (very full) Sep 5-19-91, general hist. review, pors. (full) \* Feb 27, Mar 5-92, *Sci Am* Mar 9-89, Prov. *St R J* Mar -91



**Electric LIGHTING, BALL system** *Sci Am* Feb 9-89BANGOR, Me., Brush munic. plant *El Wld* June 29-89BERLIN *El Rev Lond* July 19, 26-89; Kaiser gallerie *The Eng* Sep 21-88BOSTON, Edison station (full) *El Eng* \* Aug 10-92BRADFORD, map *El Rev Lond* \* June 10-92BRIGHTON, Crompton report *El Rev Lond* Mar 7-90BROOKLINE Gas Light Co., Mass., station *El Eng* \* Mar 16-92BROOKLYN, N. Y., Edison station, development, Field *El Eng* \* Mar, *El Rev* \* Mar 1, *El Wld* \* Feb 22-90, (full) \* Dec 21-89BRUSH-Swan station effc. test, Bedell *El Wld* Sep 10-92BUOYS, N. Y. harbor (cables) *El Rev* \* Mar 12-92CAMBRIDGE, England, station (full) *Eng* \* Nov 4-92CANCE system *Eng* July 19-89CHELSEA, England, distrib. with accums., Webber (full) *El Rev Lond* \* Oct 4-89CHICAGO, Ill., Wash. Park, Scheffler *El Eng* \* Nov 30-92; *Eng* \* June 19-91CINCINNATI, O., Hickenlooper station (working plan and el.) *El Wld* \* Aug 24-89CLINTON, Mass. station *El Eng* \* May 20-91CONDENSERS, future of, Swinburne *El Eng* \* Jan 6; spark and air jet expts., E. Thomson \* Feb 24-92. See also ELEC. condensersDEPTFORD, Ferranti mains *El Eng* \* July 9-90; alt. system *El Wld* \* Dec 8-88DOMESTIC, O'Keenan primary applic. to, Shedlock *El Wld* \* July 7-88; plant test, Segundo, July 12-90, *Industries*. See also ELEC. Lamps, incand. — lighting, incand.DUBLIN station *El Rev Lond* \* Sep 16-92; *The Eng* Oct 2-91EASTON system *El Wld* \* Nov 30-89EDISON, pat. suit in England (full) *El Eng* June- Sep -88; station test, Hill (full) *El Rev Lond* Dec 21, 28-88; and Swan United Co. report, Aug 2-89, Aug 1-90, July 22; feeder and main pat. hearing, Aug 5-92; Edison Illum. Co's pro. *El Rev* Aug 24, *El Wld* Aug 24; Canada decis. (full) Mar 23-89; and Swan pats., legal decis. *The Eng* Dec 21-88; three-wire central station system \* Nov 15, 22-89. See also ELEC. Co's, Edison; ELEC. lamps, incand, etc.



**Electric LIGHTING**, EIFFEL tower plant *Eng* \* June 21, (full) *Sc Am Sup* \* July 27-89

EMS, Imhoff, abs. *Inst C E* v 92 -88, *Cntral Elek* -87

ENGINES, high and low speed, Powers *El Eng* \* July -88; Edison direct connected trip-expan. and generator \* Apr 29-91; high speed in, Thurston *El Rev Lond* Aug 29, *El Wld* Aug 9-90; independent engines for incand. stations, Church \* Mar 3, *El Rev* Feb 25-88; 1000 h.p., Berlin, inset *The Eng* \* Apr 11, 11-90. See also ELEC. light stations; ENGINES

FERRANTI system, Haskins *El Eng* Feb 25, *El Wld* Feb 28-91

FRANKFORT-on-Main *El Rev Lond* Feb 28 \* Mar 7-21-90; exhib. May 29-91; report, abs. *Inst C E* v 100 -90, *Elek Zeit* v 5 -90; station, Miller report *The Eng* \* Sep 30-92

GENEVA, Chavannes, abs. *Inst C E* v 95 -89, *Lum Elec* v 29 -88

HANOVER, Kohlrausch, report, abs. *Inst C E* v 100 -90, *Elek Zeit* v 5 -90

INCANDESCENT stations, independent engines for, Church *El Rev Lond* \* Apr 18-88; prog. Böhm \* Oct 9, 16, (full) *El Wld* \* Sep 12-91; Ottawa, Ill. Valley plant, long dist., map *E News* \* Oct 5-89; carbon filaments, Fitz-Gerald, n *The Eng* May 18-88; Adelphi theatre plant, Edison-Swan Co. \* Jan 25-89. See also ELEC. lighting, London, etc. — stations

KESWICK water-power station, Fawcus *Eng* May 30, and discuss., inset *Inst C E* \* v 102 -90

LIVERPOOL stations *El Rev Lond* Jan 30-91; license *E Rec* Sep 22, Oct 13, 27-88

LONDON *El Rev Lond* May, June 14, schemes, July, Aug -89; prog., Bailey (full) Dec 19-90; Elec. Supply Corp. report, Apr 1-92; prog., Bailey *El Wld* Jan 10-91; ed. *Eng* May 24-89; Pruden. Assur. Co. offices station \* Feb 14-90; Naval exhib. \* Nov 27 \* Dec 11-25-91 \* Jan 1, 8-92; Lond. Supply Corp., Deptford *E & Min* Nov 10-88; *E News* July 4-91; Lond. Cen. station, Gilley *Soc Arts Mass* -90

*The Eng* Deptford incand. station, Lond. Elec. Supply Co.

Oct 26-88 \* Apr 5, 12 \* May 31; Kensington incand. station.

House to House Elec. Sup. Co. \* Feb 8-89; \* Sep 5, 12 \*

Oct 24 \* Nov 7 \* Dec 5, 12, 26-90; Met. Sup. Co., map \*

Jan 16, 16 \* 28 \* Mar 6, Scotland Yard \* May 8-91; St.



**Electric** LIGHTING, London

- Pancras station, Regent's Park \* Feb 19, 26; Notting Hill \* Apr 15; Westminster Sup. Co. \* May 13; \* Sep 9-92
- LOOMIS system *E News* \* May 18-89
- LOWELL light and power station, Shaw *El Eng* \* Jan 14-91
- MASSACHUSETTS statistics *El Wld* Mar 26-92
- MELBOURNE exhibition, Murray *El Rev Lond* Nov 15-89
- MOLDINGS, inset *El Eng* \* Sep 10-90
- MOTORS, trials *El Rev Lond* Feb 22, report *Eng* \* Feb 22 \* Mar 1-15, *F Inst* May -89, *J Soc Arts*
- MUNICIPAL, Francisco *El Rev* Aug 30, *El Wld* Aug 30-90; Bangor, Me., plant, Brush, June 29-89; St. Louis 'Munic.' arc system, Ayer (full) Sep 19; by munic. authorities, H. Robinson *E News* Sep 12-91
- NATICK, Mass., station *El Eng* \* Aug 6-90
- NEWCASTLE-on-Tyne Elec. Sup. Co. station, Heaviside *El Rev Lond* Oct 28-92
- NEW York City, Edison 26th st. station, (full) *El Wld* \* Jan 19-89; Madison Sq. Garden, Sullivan \* Nov 14-91; \* Jan 2-92
- OXFORD station (full) *El Rev Lond* \* July 8, *The Eng* \* July 1-92
- PARIS, exhib. '89 *El Rev Lond* Mar 29-89, Mar 21, 28, Apr 4, May 16, 23, 30-90; Sector of Place Clichy works \* May \* June 5-91; exhib., Heister system *El Wld* \* Aug 24-89
- Eng* Palais Royal Edison station \* Mar 8; exhib. \* May 3, portable military plant, July 19, Oerlikon plant, 26, \* Nov 15, 22-89
- Inst C E* Paris markets, Andra, abs. v 100 -90, *Genie Civil* \* v 16 -89; station, Meyer, abs. *Inst C E* v 105 -91, *An Ponts* v 12 -90; Nansouty, abs. *Inst C E* v 108 -92, *Genie Civil* \* v 20 -91; exhib., Fontaine *Sc Am Sup* \* May 25 \* Aug 17, Gramme station \* Oct 19-89; Boul. Rich works, Lenoir \* Jan 2-92;
- The Eng* Paris exhib. \* May 3-31 Oerlikon works \* June 14, 21, T-H system \* 28, station, July 26, Soc. Gramme do. Sep 20-89
- PHILADELPHIA, Edison station *El Eng* \* Oct 8-90, *Pwr* \* May -89
- PORTABLE plant *Eng* \* Feb 10-88; light port. military, Paris exhib. July 19-89, do. Charlesworth *Sci Am* Nov 17-88, do. ap., Suez canal *The Eng* Oct 12-88



**Electric** LIGHTING, PROVIDENCE, R. I., Narragansett Co. station

*El Eng* \* Sep, (full) *El Rev* sup. \* Aug 17, Henthorn (full)

*El Wld* \* Aug 17, *Pur* \* Oct -89, *St RJ* \* Aug -90

REGULATIONS, light and power service rules, Columbian exhib.

*El Eng* Dec 28-92; station, safety *El Rev Lond* Jan 11-

89; acts 1882 and 1888, Jan 10; (full) Oct 17-90; rules

for work, Benjamin *El Rev* May 10; and motive power,

for install. of, Boston Manuf'rs Mut. Ins. Co. Aug 23, do.

*E News* Aug 9; ins. rules, com. report *El Rev* Aug 30, Sep

27, Jenks, 27, N. E. Ins. Exchange, Nov 8-90, do. *El Wld*

Apr 21-88; rules, com. report, Sep 19-91; rules, for safe

install. *E News* Aug 9-90, Oct 3-91; rules for *E Rec* Aug

16-90. See also ELEC. insurance regs.

ROPE gear for elec. light work, Booth, Lea *El Rev Lond* June

26-91

RULES. See ELECTRIC lighting regulations

SAFETY devices E. Thomson *El Eng* Mar, *El Wld* Feb 22-

90; station safety regs. *El Rev Lond* Jan 11-89. See also

ELEC. lighting regs.

ST. Brieux *El Wld* \* May 16-91, *El Rev Lond*

ST. Catherine's Point light-house, most powerful light in world

*Sc Am Sup* \* July 21-88, *The Eng*

ST. Louis 'Munic.' arc system and station (largest in world) *El*

*Rev Lond* Jan 16, report (full) *El Wld* Jan 3, Ayer (full) Sep

19-91

ST. Paul Gas Co. station *El Wld* \* Feb 23-89

SALEM, Mass., T-H station *El Rev* \* June 15, (plans) *El Wld*

\* June 15-89 \* Mar 15-90 \* Feb 14-91

SOPHIA City *El Rev Lond* June 17-92

SPERRY system *El Wld* \* June 15-89

SPOKANE Falls station *El Wld* \* Sep 13-90

STATIONS *Am C E* Edison incand., test of, Hill, and discuss.

v 18 -88; *Cassier's* speed reg. of engines, Aldrich, May -92

*El Eng* incand., independent engines for, Church, Mar

-88; stats., U. S. Aug 20; value of detail in, DeCamp \* 27-

90; distrib. of steam from, Prentiss \* Feb 25; central,

management and finance, Foster, Apr 22, 29, May 6-20, June

3-24, July; op. by water power, Redman, Sep 16-91; fly-

wheel accidents, Emery, Feb 10, 17; effic. and higher econ.,

Vail, Nov 23, 30, Dec 7; light and railroad plants op. from

same station, M Cay, Dec 28-92



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*El Rev Lond* independent engines for, Church \* Apr 18; transformers vs. accums., Crompton \* Apr 20, 27, May 4; breakdowns, R. J. Jones \* June 22; cost, Fritsche \* Aug 31-88; cen., notes, Yeaman, Nov 21-90; materials \* Mar 13; combining contin. and alt. cur. systems, Leonard, Oct 2, 9; how to get paying loads for, Marks, Dec 4-91

*El Rev* construction, Woodbury \* Feb 22; econom. steam gen., Babcock, Mar 1; accounts system, T. C. Smith, Mar 1; insurance, Barton, May 31, July 19-90; building, Berlin Iron Bridge Co. \* Jan 10; steam distrib. from, Prentiss, Feb 28; accounts, uniformity in method, Burleigh, sup. Sep 19; cen., op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-91; and power, Mackie, July 28, 30, Aug 13, 20, Sep 10-24, Oct 8, Nov 5, 12-92

*El Wild* accounts, T. C. Smith, Feb 22; Woodbury \* 22; value of details in, DeCamp, Aug 30; as an investment, Sunny, Oct 25-90; steam distrib. from, Prentiss \* Feb 28; uniformity in accounts, Burleigh, Sep 19; op. by water power, Redman, 19; how to get paying loads for, Marks, Nov 21-91; the lamp, manager and customer, Roberts \* Mar 19; load curves \* Feb 27-92, \* *Electrician Lond*

*E News* Keswick, England, water power, inset \* Sep 13-90; op. by water power *E Rec* Oct 10-91; running *Pwr* \* Sep - Dec -90 \* Jan - Mar \* Sep \* Nov -91; hazards, Low *Sc Am Sup* Apr 9-92; stats. *St R J* Sep -90; Soc. L'Eclairage Elec., France *The Eng* \* Nov 1-89; U. S., Addenbrooke, Jan 10, 24, 31-90; arc station management, June 24-92. See also ELEC. lighting, names of places

SUEZ canal, Sellon *El Rev Lond* \* Sep 14-88

TAMWORTH, New So. Wales, Dymond *Inst C E* \* v 108 -92

TESLA's system with curs. of high frequency *El Rev Lond* \* July 17, *El Rev* \* July 4-91

TIVOLI station *El Rev Lond* \* July 15-92

TOPKKA, Kan., Kingman, discuss. *Am C E* v 26 -92

VENICE station *Eng* \* Aug 14-91

WASHINGTON, U. S. Navy Yard, Brush arc station, Wilkes *El Eng* \* May 21-90

WESTINGHOUSE alt. arc system *El Eng* \* Apr 2-90; (full) *El Rev* and sup. \* Oct 27, alt. stations (list) Nov 10-88; *Eng* \* Feb 8, 22 \* Mar 15-89; abs. *Inst C E* v 101 -90



**Electric LIGHTING**, WESTMINSTER Elec. Light Co. station *El Rev Lond* \* Mar 18-92

WIRING leads cal., graphic method, Hering *El Eng* \* May 27-91. See also ELEC. wires

WORCESTER, Mass. station, Shaw *El Eng* \* Dec 10-90

LOAD equalizer, Mailloux *El Rev Lond* \* Dec 26-90

LOCK, electro-mag. permutation, Sedgwick's *El Rev* \* Sep 28-89

LOCOMOTION, Edison pat. *El Rev* \* Oct 4-90

LOCOMOTIVES, Dobbie's gearless *El Eng* \* June 10; Eickemeyer's gearless *El Rev* \* June 13-91; proposed, Pellissier *El Wild* \* Aug 6; tests, Siemens \* 27-92; ed. *The Eng* June 13-90

LOG *El Rev Lond* \* Jan 30-91

MACHINES, Wilmhurst influence, Darke, cor. *Eng* \* Feb 14-90, theory, Pellissier *Sc Am Sup* \* Nov 14-91. See also ELEC. influence machine; DYNAMOS; ELEC. motors

MAGNETIC susceptibilities of various iron and steel, Niegbaur *El Eng* \* Feb -90; reluctance, Kennelly (full) \* Nov 4-91; propagation, E. Thomson, Wightmann *El Rev Lond* \* Oct 26, do. *El Wild* \* Oct 27-88; screening, variational, W. Thomson \* May 9, do. *El Rev Lond* May 1-91; leakage, Ives \* Jan 22, 29; balance, Du Bois \* Sep 2, do. *El Wild* \* Sep 24-92; non-magnetic balances and alloys, Haswell, Webb *El Rev* June 23-88; field, change of form affecting, Dolbear, Mar 21-91; permeabilities of irons, Thompson \* July 2-92; call and integr. graph, the Abdank *El Wild* \* Nov 24-88; Eickemeyer's gauge \* Nov 9-89; mag. circuit notes, Steinmetz, June 4; permeabil. of special irons, M. E. Thompson \* 25; viscosity expts., Hopkinson \* Oct 1-92; field, early conception, Houston *F Inst* Mar -92; circuit, theory, Collins *Tech Q* \* May -89

MAGNETO-motive force and mag. formulas, Emery (full) *El Rev* \* Aug 27 \* Sep 3-92

MAGNETS, permanent, character of steel used for, Preece (full) *El Rev Lond* \* Sep 12-90

MAGNETISM, relation to induced elec. mo. force and cur., E. Thomson (full) *El Wild* \* June 1, *El Eng* \* June -89; Hopkinson \* Apr 9-30-90; twisting, Balch \* Sep 14-92; in watches, Giles *El Rev Lond* \* Oct 26, Gribi *El Rev* June 8, (full) *El Wild* \* June 30-88; induced, Ewing \* Oct 4, 11, *El Rev Lond* \* Oct 3-90. See also MAGNETISM



**Electric MAGNETIZATION**, permeabil. of iron at right angles to direction of, Kennelly *El Eng* \* June 11, 18-90; curves for, Emery \* Dec 28-92; of iron, time-lag in, Ewing (full) *El Rev Lond* \* Nov 8-89; changes produced by, in length of iron wires, Bidwell, Oct 14; of iron, electro-chem. effects, Andrews \* Nov 25-92; formulas, Emery (full) *El Rev* \* Aug 27 \* Sep 3-92; of iron in very strong fields, Ewing *El Wld* Dec 22-88; curves of iron, under alt. curs., Moore \* June 4-92; theory and formula for soft iron, Collins *Tech Q* \* May -89

**MEASUREMENTS**, W. Thomson's instrums., Fleming *El Wld* \* Feb 25, *El Eng* \* May -88, by Weston high resist. voltmeter, Loomis \* Dec 24-90, *El Rev Lond* \* Jan 9-91; measuring ap. standardizing, Berlin, Aug 9-89; Anthony *El Rev* Jan 21; methods, Liebig, sup. Sep 8-88; wiping contact methods for cur. and poten., Thomas \* July 30, *El Wld* \* July 2-92; volta-metric of alt. curs., Kennelly \* Nov 3; in a house to house supply, Lowrie \* 17-88; units and measures, Internat. conference, Paris (full) Sep 21-89; applics. of Weston voltmeters and ammeters, Maschke (full) \* Mar 26 \* Apr 2-23-92; Lowrie *Eng* Oct 5-88; Webb *E Mag* Oct; instrums., Swinburne *E News* Sep 15-29, (full) *Inst C E* \* v 110-92, *The Eng* \* May 6-92; as applied to commercial work, Anthony *F Inst* Jan -88; constant shunt method for large contin. curs., Pike \* June -92; resist., Bauer *Pwr* \* Mar -92

**METERS** *El Eng* Shallenberger's \* Sep -88; Edison chem., Jenks (very full) \* Jan -89; the Walker \* Apr 9; Wood's \* Dec 17-90; the Meylan-Rechniewski energy \* Mar 18, Eickemeyer's differential magnetometer, Steinmetz \* 25; alt. cur. potentiometer, Moler \* May 27-91; Pilkington-White \* Apr 13 -92

*El Rev Lond* Geyer-Bristol, for direct and alt. curs. \* Dec 21, 28-88; Edison chem., Jenks, Jan 11 \* 25, Feb 1, 8; for central stations, Forbes, Feb 1, 8; Cardew recording \* Nov 15-89; com. report, Mar 28; Blathy alt. cur. \* June 20; Thomson's \* Aug 15; W. Thomson's \* Oct 10; Mares' energy \* Nov 7; Shand, Dec 5-90; Meylan-Rich. energy \* Feb 13; Fer-ranti's \* Mar 20; Frere's \* 20-91; Brillie energy \* Apr 29; Scott's \* Dec 16, *The Eng* \* Dec 16-92

*El Rev* for central stations, Forbes, Feb 16; the Slaterry \* Oct 12-89; Edison electrolytic, Kennelly \* Oct 4-90; Wal-ker, May 30, discuss. June 13-91



**Electric METERS**

*El Wild* Shallenberger's alt. cur. \* Sep 15; Geyer-Bristol, for direct and alt. curs. \* Nov 24; Reckenzaun & Pentz's \* Dec 29-88; Edison chem., Jenks (full) \* Jan 5; Nipkow's alt. cur. ammeter \* Mar 9; E. Thomson's oscillating \* May 4; the Walker \* July 20; the Manwaren \* Dec 7-89; the Walker \* Apr 12, May 30, discuss. June 13; Shand, Nov 22-90; Perry's elec. supply \* July 11-91

*Inst C E* for recording consumpt. of elec. energy, Wordingham, insets (full) \* v 108-92; Mares' energy, Juppout, abs. v 103-91. *Genie Civil* \* 17-90; Hobart *Pwr* \* June-Sep -89; the Wood ammeter *Sc Am Sup* \* Jan 14-88; radiation meter, Gregory \* Dec 14-89; \* Jan 25-90; the Frager *The Eng* \* May 29; the Teague \* June 19-91. See also **ELEC.** ammeters—ohm—secoh—tele—volt—watt meters

**MINING** machinery, Atkinson *Eng* Feb 13, *E News* \* Aug 8; energy transmiss., Leonard and ed. \* May 16, Edison elec. percussion drill, 16; Aspen Min. & Smelting Co. \* Oct 10-91

**MOLDINGS**, standard for elec. work *El Rev* \* Nov 15-90

**MOTIVE** force, thermo-chem. relation to, Siebel *El Eng* July 9-90, relations to atomic wt., chem. heat, etc., Gore, *El Rev Lond* June 12-91, general relation to equiv. vol., Gore, June 3-24-92, constant with variable speed, Hoho *El Wild* \* Jan 25-90, equation, for resist. and self-induc. circuit, Bedell (full) May 14-28, June 4-92; properties of the human heart, Waller \* Nov 3, *Sc Am Sup* \* Nov 24-88, *El Rev*; power, Thorenberg plant *Sci Am* Dec 1-88

**MOTORS**, *Am C E* comparative tests and st. locom., Manhattan eleva. R., Moss, and discuss., insets \* v 23-90

*El Eng* alt. cur., Duncan (full) \* Mar, Mar; Liebig, Mar; designing, Walker, May; 2 h.p. Sprague, expts., Cox \* June \* Aug; alt. cur. and transformers, new system, Tesla (full) \* June, June, Swinburne, Sep; service charges basis, Lufkin, Sep -88

*El Eng* diags., Clarke \* Jan; regulation, Crocker \* June; and dynamos, Perret \* Aug; speed regulation, Deprez on. Paget \* Aug; alt. cur. evolution, Patten \* Oct -89

*El Eng* Swinburne's alt. cur. \* Apr 16; Tesla's alt. \* Aug 6; rates basis, Lufkin \* 27; Tesla's new alt. Sep. 24; building, Short elec. R. system \* Oct 15; Bradley's alt. \* Nov. 5, self-exciting \* 12; windings, Serrell, Dec 10; Riker low speed multipolar contin. cur. \* 17-90



**Electric Motors**

*El Eng* inventors of (Thomas Davenport) Pope (full) \* Jan 7-28 \* Feb 4; Patten's alt. \* Mar 4 \* May 18; alt. cur. design, Weston \* Apr 1; perfection of stationary, Crocker \* May 27; alt. cur., Hospitalier, Aug 26; op. at any speed or torque, with max effc., Leonard \* Nov 25; law of max. effc., Mailloux, Dec 9; polyphasal generators, Pupin \* 23-91

*El Eng* the Perret (full) \* Jan 6; law of effc., Mailloux, Jan 18; alt. cur., Stanley \* Mar 2; gearless, Short \* Apr 18; Excelsior, Muldaur \* Sep 14; Lundell fan \* Dec 7-92

*El Rev Lond* simple \* Apr 13; alt. cur., Tesla's new system \* June 15, ed. 22 \* 22-88; design, Snell, Feb 1; speed reg., Deprez, Apr 26, *Compt r*; regulation, Crocker *El Rev Lond* \* June 14; alt. cur., evolution of new type, Patten (full) \* Oct 11-89; armature reactions, theory, Swinburne \* Feb 14, 21, Mar 28, Apr 4; op. with high tension curs., Sperry \* Feb 21, 28; design, Esson \* 28 \* Mar 7, 14; Tesla's alt. \* Aug 22, Oct 3-90; alt. cur. design, Weston \* Apr 17; Hutin & Leblanc's alt. cur. \* July 24; Edison's \* Aug 21-91; leakage, Ives \* Jan 22, 29-92

*El Rev* Liebig, Feb 25; alt. cur. and transformers, new system, Tesla \* June 2, 9, Weyde \* July 14; service charges basis, Lufkin, Sep 22-88; Bradley alt. cur. imps. \* June 22; alt. cur. Patten \* Sep 28-89; armature reactions, theory, Swinburne \* Mar 15; imps. do. \* Apr 19; Tesla's alt. cur. pats. \* Aug 16; rates basis, Lufkin \* 30-90; Eikemeyer's novel \* Mar 28; Edison small slow speed \* May 30; the perfection of stationary, Crocker \* June 6; alt. cur., Hospitalier, Sep 12; Bradley's alt. cur. \* Oct 2; perfect, Everett, 31; aut. op. at any speed or torque, Leonard \* Nov 28-91; alt. cur., Stanley \* Mar 12; Ryan series reg. test, Bliss, Dec 31-92, *Sib J Eng*

*El Wld* the Patten \* Jan 7; effc. tests, Crane \* Feb 4; alt. cur., Duncan (full) \* 25; Liebig, Mar 3; reg., priority of invention, Sprague \* Apr 7, 14; cal. and designing, Crocker \* 28; alt. cur. and transformers. new system, Tesla \* June 2; the Lugo \* July 14; service charges, basis for cal., Lufkin \* Sep 8; designing, Owens \* Nov 17-88

*El Wld* alt. cur., Tesla, May 25; reg., Crocker (full) \* June 1, discuss. \* 8; the Perret \* Feb 2, July 6 \* Aug 3; alt. cur. ev. of new type, Patten (full) \* Sep 28; Industries' prize, n \* Dec 7; new prin. of constructing, Mailloux \* 28-89



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*El Wld* relation to elec. lighting Co's, Fitzgerald \* Feb 1; op. with high tension curs., Sperry, 15; design, Esson (full) \* Mar 22, 29 \* Apr 5, 12; the Zipernowsky-Deri-Blathy synchronous \* Mar 29; Perret multipolar \* July 26; alt. cur., new types \* Aug 16; Van Depoele induction \* 16; rates basis, Lufkin, diags. \* 30-90

*El Wld* work of Dow, in torpedo service, Apr 18; alt. cur., Duncan \* May 9, 16; perfection of stationary, Crocker \* May 30, discuss. June 6; alt. cur., Hospitalier \* Aug 29; Frankfort-Lauffen three-phase, Hering (full) \* Oct 31 \* Nov 7; aut. op. at any speed or torque, with max effic., Leonard \* Nov 28-91

*El Wld* magnetic leakage, Ives (full) \* Jan 2; alt. cur., Stanley (full) \* Mar 5; alt. cur. self-starting and exciting synchronous, Patten \* Apr 2; cal; Bedell, diag. \* 30-92

*Eng* alt. cur., ed. Nov 20; the Short gearless *E News* \* Sep 5-91; in workshops, Jenkin *Inst C E* \* v 102-90; small, effic., Clifford, abs. v 91-88, *Am Acad Arts & Sci* v 22-87; *E Rec* \* Nov -90; cal., Bedell, inset *F Inst* \* June -92

*Pwr* the Baxter \* Dec -88; Thomson's \* Jan; reciprocating \* Feb -89; Simple \* Jan -90; (various) \* Jan -92, *Elec Industries*; (growth of business) Pope *R & Eng* Sep -89

*Sc Am Sup* the Menges thermo-mag, generator \* Feb 18; simple, making, Hopkins \* Apr 14; charges, basis for cal., Lufkin, Sep 22, Nov 3-88; the Tesla \* Apr 6-89; home made, Parkhurst \* Aug 2-90; small, Hopkins \* Jan 3-91

*St R J* building, Short R. Co. \* Oct -90; max. effic. conditions, Leonard, Mailloux, Jan-92; small, effic., Clifford *Tech Q* Sep -87, Feb 89; small, comparative working expenses of, Korte *The Eng* Jan 22-92, *Zeit deut Ing* -91. See also DYNAMOS; ELEC. generators; RAILROADS, elec. motors

NAVIGATION, Bennett, *El Rev Lond* Apr 10-91.

OHM'S law, extension of elec. mo. force and Oudin *El Eng* Dec 30-91; expt. proof, Mayer \* July 9, *El Rev Lond* Aug 1-90; units, the volt, ohm and ampere, Nipher \* Apr 27, ohm det., Wuilleumier, July 13-88, suggestions, J. V. Jones (full) Sep 12; the Evershed *El Wld* \* Jan 11-90; alt. cur., Swinburne \* Dec 19-91; units, ohm, Glazebrook, Jones *Eng* Sep 26-90, new det. of *Sc Am Sup* \* Feb 16-89; law and electro-therapeutics, Winton, July 28, expt. proof, Mayer \* Aug 2-90, *Am J Sci*. See also ELEC. units



- Electric OMNIBUS**, London *Sc Am Sup* \* Mar 2-89, *El Eng*  
 ORE-dressing, Tilly Foster mine, McDowell *E News* Oct 4-90  
 ORGAN, control, Hope-Jones *El Rev Lond* Jan 15-92; Wacker's  
 action *El Wld* \* Nov 23-89; organs, Swinburne \* July 4-91  
 OSCILLATIONS, Hertz's researches, Tunzelmann *El Eng* Feb \*  
 Apr, May \* July \* Aug, Joubert \* Oct -89; in air, Trowbridge  
*El Rev Lond* Oct 17, (full) *El Rev* \* Dec 6-90  
 PARCEL exchange system, Bennett *El Rev Lond* \* Sep 4, *Eng* \*  
 Sep 25-91  
 PATENTS, U. S. stats., Lockwood *El Eng* Feb -88; see *El Rev*  
 files, especially 1890, progressive \* Mar 26 \* Apr 16 \* June  
 4-92  
 PIPE bending *El Wld* \* June 18-92  
 POLYPHONE, Zigang's *Sc Am Sup* \* Oct 12-89  
 PORTELECTRIC Co's transport. system, N. E. *El Eng* \* May 27,  
 Pope report *El Rev Lond* June 5 *El Rev* \* May 30-91, do.  
*El Wld* May 23-91, carrier \* Oct 10-90  
 POTENTIAL, high, phenomena, Skinner *El Wld* \* May 7; differ-  
 ences, Negbaur, Nov. 26, Dec 3. 10-92  
 POWER, elec. motor and st. locom. test, Manhat. eleva. R., Moss.,  
 insets *Am C E* \* v 23 -90; distrib., Spaulding, insets *Cassier's*  
 \* Dec -91; and steam, Wright, Aug -92  
*El Eng* standards of econ. in gen. of, Swetland \* Aug 27-  
 90; comparative cost, effc. of large and small motors,  
 Wheeler, Apr 29; econom. limits of large units, Church \* Dec  
 2, 9-91; Edison works, Schenectady, N. Y., Martin (full) \* Feb  
 8; plant at Chic. World's fair, Collins \* Mar 23-92; distrib.  
 by alt. curs., Tobey *El Rev Lond* \* Feb 5; distrib. by direct  
 curs., Dow, 26-92; rates *El Rev* Aug 1-91  
*El Wld* measurement by voltmeter, Swinburne \* Apr 18;  
 measurement of any elec. cur. to any circuit, Ayerton, Sumpner  
 \* May 2, 23; measurement developed by alt. curs. in any cir-  
 cuit, Hering \* Dec 26; distrib. by alt. curs., Stanley \* June 13-  
 91, Leblanc *Lum Elec*  
*El Wld* distrib. by direct curs., Dow, Feb 6; by alt. curs.,  
 Stanley, 6; Thomson's law of economy, Carter, July 30; station  
 distrib., Unwin, Aug 20, 27; supply cost, Hopkinson, Dec 3,  
 10, 24; gen. at coal-fields and transmiss. to industrial centers,  
 Thwaite \* 31-92  
*Eng* econom. limit of large units, Church, Jan 8; altruistic  
 effects, Perrine *E Mag* Jan -92; technically considered, W.



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Allen *E News* \* Nov 1-90; distrib., Spaulding *Pwr* \* Dec -91, *Am M E*, *Sc Am Sup* Jan 16; gen. in coal-fields, Thwaite *The Eng* Dec 2-92. See also ELEC. motors; RAILROADS, elec. power stations

POWER Transmission, *Am Min* present status, Rothwell v 17 -89; in mining operations, Spaulding, insets (full) \* v 19 -91 *El Eng* (energy) \* Feb -88, *Industries*; Kapp *El Eng* Mar 25; at very high potens. \* Apr 8; Leonard (full) Sep 2-91; long dist., Hart \* Jan 13; high poten., E. Thomson, Mar 23; long dist., Scott \* June 15-92

*El Rev Lond* Sprague, Mar 22 \* 29, May 10; long dist., from over compounded gens., Serrell \* Dec 6-89; Kapp, tables, Feb 20, Mar 6, (full) July 17 \* Aug 7-28-91; Frankfort plan, Hering, Apr 8; multiphase and distrib., Reckenzaun, Apr 29 \* May 13, June 24; long dist., Thwaite, Dec 16-92

*El Rev* Roberts \* Aug 31-89; Kapp (full) Aug 8; long dist., Frankfort, alt. curs. differing in phase (rotary curs.), Dolivo-Dobrowolsky \* Sep 19; Lauffen-Frankfort, Kapp \* Oct 10-91; long dist., Hart \* Jan 16; high poten., E. Thomson, Mar 26; long dist., Scott \* June 25; by alt. curs., Kapp \* Sep 17; future, Oct 15-92, *Industries*; *Electrician Lond*

*El Wld* long dist. calcs., Serrell, table, May 25; Roberts \* Aug 17; long dist., from over-compounded gens., Serrell \* Nov 16-89; Mar 14; high pressure, at Oerlikon, May \* Apr 18; Lauffen-Frankfort plant, Hering (full) \* Sep 26 \* Oct 31 \* Nov 7; by alt. curs., Dolivo-Dob. \* Oct 10-91

*El Wld* Lauffen-Frankfort tests, Hering, Jan 9, discuss. (full) Mar 5, effic. \* July 2; diags., Schlesinger \* Mar 5; Bell, 19; high poten., E. Thomson, 26; multiphase, Reckenzaun, May 21, June 11, July 23; long dist., Scott (full) \* June 18; effect of harmonics on alt. cur., Rowland, Dec 10; gen. at the coal-fields and transmiss. to industrial centers, Thwaite \* 31-92

*Eng ed.* Feb 20, 27, Mar 6-91; cost, Mansfield, n *E & Min* June 23-88; Rothwell, Jan 5-89; in the west, July 23-92, *El Eng*; Nevada mill *E News* Apr 12-90; alt. curs. for \* Aug 22-91; Hering, Mar 19-92; Sprague *F Inst* \* Mar -89; Lauffen-Frankfort, table, Aug; Griffin (full) Sep -92; by alt. curs., Stort abs. *Inst C E* v 106 -91; cost, Lahmeyer, v 109 -92, *Elek Zeit* -91-92; Geipel *Inst M E* Feb -88

*Pwr* long dist., Hart, Feb, Jackson, Apr, high poten., E.



**Electric Power Transmission**

Thomson, May; Griffin \* Oct -92; Morris *R & Eng* May -92; \* Oct -90, *Genie Civil*; Sprague (full) *Sc Am Sup* \* July 20, 27 \* Aug 3-89; \* Mar 3-88, *Industries*; long dist., Hart *Tech Q* \* Apr -92; Kriegstettin to Solothurn, expts. *The Eng* Apr 13-88; West, Jan 16; Lauffen-Frankfort install. \* Oct 2, 9, oerlikon alternator \* 23-91. See also RAILROADS, elec. power stations

PROJECTILES, elec. welded, Maxim *Cassier's* \* Oct, *El Rev* Aug 6-92

PUMPS, pumping in collieries, Brain *El Eng* Jan -88; Dittman's vac. *El Wld* \* June 4-92; Hall's pumping plant *E News* May 5-88 \* Mar 15-90; three-cyl. elec., Gould Mfg Co. \* Nov 14 -91

RAILROADS, elec. working of, W. E. Hall *E News* July 12, limitations of steam and electricity in transport. 12-90. See also RAILROADS, elec.

RECORDING instrums., Holden, Drake and Gorham's *El Rev Lond* \* Sep 30-92

REGISTER, Ongley *El Rev* \* Jan 31-91

REGULATORS, Herrick *El Wld* \* Apr 5-90

RESISTANCE, *El Eng* compensated standards, Nichols \* June -88; specific, of paper \* June; of elec. light installs., Jamieson, Oct -89; specific, of metals and alloys, Prescott, Apr 30, May 7; inductive det., Steinmetz, Oct 29, Nov 5-90; insul., measuring, Patterson \* May 20; of copper, standard for, Holman, Nov 18; compensating, for galv. shunts, Frey \* Dec 23-91; standards, Willyoung, June 1; insul., of cotton and silk covered wires, Luquee \* Dec 28-92

*El Rev Lond* compensated standards, Nichols, Aug 10-88; insul., of elec. lighting station, Jamieson, Jan 25; standard, design, Fleming \* Feb 1-89; of mercury, Glazebrook, Sep 19; spec., of copper, Fitzpatrick (full) 26; of metals, Le Chatelier \* Oct 17; wire standard resists. Dec 26-90; human body, value of diminished, Cardew, Mar 13; of conductors, measurement, Appleyard \* Dec 18-91; of pure metals, alloys, Nov 11-92; of mercury, det., Glazebrook *El Rev* \* Oct 18 -90

*El Wld* compensated standards, Nichols, June 9-88; of iron and its alloys at high temps. \* Apr 19; of mercury, det., Glazebrook, Oct 11; wire standard resists., com. report, Dec 6;



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coils and boxes, Frey \* 20 \* 27-90 \* Jan 3, 10; coils, alloys for, Feussner, Mar 14-91; non-inductive construction, Ayrton, Mather \* Feb 13; of parallel circuits, Bedell \* Oct 15-92

*F Inst* Megohm, Davids, Apr -91; standards, manuf. and adjustment, Willyoung, Apr -92; of metals, steel, Le Chatelier, abs. *Inst C E* v 104 -91, *Compt r* v 111 -90, 112 -91; of pure metals alloys *Sc Am Sup* \* Dec 31-92. See also under ELEC. insulation

RETARDATION due to iron pipes, Preece *El Wld* May 21-92

RHEOSTAT, new, C. E. Carpenter *El Rev* \* Nov 5-92

ROUTING machine, Irish's *El Wld* \* Nov 2-89

RULES, fire ins., Hartwell (full) *El Rev Lond* Sep 12-90; right hand and other rules, Maycock \* Jan 15-92; elec. light ins. rules, England *El Rev* Jan 14-88. See also ELEC. insurance rules — lighting regs.

SAFETY devices, E. Thomson *El Rev Lond* Mar 14, *El Rev* Feb 22-90. See also ELEC. insurance

SCHISEOPHONE (flaws in metals) *El Eng* \* July 16-90

SCREENING, electrostatic, by gratings, etc., W. Thomson *El Rev Lond* Apr. 17; and magnetic, variational, do. *Sci Am Sup* \* May 16-91

SEARCH light, Hutchins *Cassier's* \* Dec, Knowles (full) *El Eng* \* July 27 \* Aug 3, 24-92

SECOHMETER, Ayrton & Perry's *El Rev* \* Apr 20-89

SECRET service, individual telegraph call *R Gaz* \* Aug 28-91

SEEING to a distance, Weiller, cor. *Sc Am Sup* \* Feb 8-90, *Genie Civil* v 15, *Lum Elec*, *El Rev*

SEWAGE purification, Gilley *Soc Arts Mass* -90

SHUNT, constant method, errors in, Puffer *El Rev Lond* May 11-88

SIGNAL ap., Morgan's aut. system *El Rev* \* June 7, *Eng* \* May 16-90

SMELTING and production of aluminum, Boby *Sc Am Sup* \* July 13-89. See also ALUMINUM

SNOW sweeper, General Elec. Co. *Sc Am Sup* \* Dec 31-92

SOLENOIDS, properties, S. P. Thompson *El Rev* Feb 21-92; variable action of two-coil, Aldrich *F Inst* \* Apr -92

SPARKS, nature, in elec. vibrations of Hertz, Bischoff *El Rev Lond* \* Sep 25, Oct 2-91; sparking, Serrell *El Wld* \* Nov 10-88



- Electric STANDARDS**, com. report *El Rev Lond* Sep 28, Oct 10-90; Oct 16, discuss. 30-91; Pellet report, Sep 13, 20, *El Wld* Sep 7-89; com. report, Sep 26-91; Brit. Assoc. Sep 3-92; com. report *El Rev* Oct 3-91, *The Eng* sup. Dec 9-92. See also ELEC units
- STOCKS**, English, table *El Rev Lond* Dec 16-92; market *El Wld* Dec 6-27-90
- STORAGE**, of the alt. cur., Foppl, abs. *Inst C E* v 102 -90 \* *Elek Zeit* -90; storage batteries. See STORAGE bats.
- STORM** phenomena *El Eng* \* Aug 24-92
- STOVE**, Giraud's thermo-elec., Hospitalier, abs. *Inst C E* v 105, 106 -91, *Genie Civil* \* v 19 -91, *Sc Am Sup* \* July 18 -91. See also ELEC. heating
- STRESS**, optical demonstration of, Rücker *Eng* \* May 18, *Sc Am Sup* \* May 19-88
- SUBWAYS**, N. Y. Bd. of Elec. Control, report *El Wld* Jan 12-89, Jan 25; practical working, Maver, discuss. Mar 15-90; of N. Y. City *E News* Apr 21 \* May 5, 26; of Phila., cor. \* June 9-88; of N. Y. *Sci Am* Apr 20-89. See also ELEC. wires, underground
- SUGAR** refining *E News* Sep 22-88
- SUPPLY**, cost, Hopkinson *El Rev Lond* Nov 11-92. See also under ELEC. lighting
- SWITCH-boards**, Manhattan Elec. L. Co. *El Rev* \* May 7; multi-ple, Baylis, July 9-92
- SWITCHES**, designing, Offrell *El Wld* June 21-90; and switch-  
ing *Pwr* \* June \* July -91
- TABULATING**, Hollerith system, com. report *F Inst* \* Apr -90. See also CENSUS counting ap.
- TANNING** *El Rev Lond* June 26 \* July 3, 10-91, *El Rev* June 14, hist. n *El Wld* Sep 27-90
- TELEMETER** system *E News* Oct 5-89; Fiske's (marine dist. instrum.) Brylinski abs. *Inst C E* v 106 -91 \* *An Telegr.* -91
- TERMS** and phrases, Maycock *El Rev Lond* \* Mar 25-92; (list) *E Rec* June 2-88
- TESTING**, Handbook of, Kempe, bk., Spon; of iron, Swinburne *El Wld* \* Sep 27-90; ap., construct. and use, Frey \* Jan 17-31 \* Feb 7-28 \* Mar 7, 14-91
- TIME**. See TIME, electric
- TRACTION**, de Coetlogon *E News* \* Aug 18-88; the Ries in-  
creaser (locomotive) \* Aug 9-90



**Electric TRANSFER** table, Sprague, Altoona, Pa. *El Wild* \* Apr 13; Fitchburg, Mass. \* Nov 16-89

**TRANSFORMATION**, alt. — direct cur., proposed system, Patten *El Wild* \* Feb 27 \* Mar 19-92

**TRANSFORMERS** *El Eng* alt. cur., Kapp, discuss. (full) \* Apr, Apr, new system, Tesla (full) \* June, and contin. cur. system, comparative value, Badt, July, Swinburne, Sep -88; Ryan, and discuss. (full) \* Jan, Jan; effic., Humphrey \* July 2-90; distrib., Swinburne \* Apr 1, 8; alt. cur., geomet. theory of, Steinmetz, June 3-24, July 1-29, Aug 5 - Dec 23-91; relation of size and effic., Stillwell, Mar 2-92

*El Rev Lond* alt. cur., Kapp (very full) \* Feb 17, distrib. by, Mackenzie \* 17, 24, Mar 2, 9, Crompton \* Apr 20, 27, May 25; new system, Tesla \* June 15, 22, ed. 22; distrib. by, Gutmann, Oct 26; (secondary generator) pats., Gaulard & Gibbs vs. Ferranti, July 13-88, Mar 8; Ryan \* Jan 17; reg. cur. or poten., E. Thomson's method \* Apr 26; hist., Wilking's, Gelyi, May 17, 24; losses due to hysteresis in, discuss., E. Thomson, Tesla, June 13; description, Swinburne (full) Sep 20; Picou, report, 20-89

*El Rev Lond* distrib., Swinburne, Feb 27, Mar 6, 20; effic., Stanley, Mar 6, 13-91; relation of size and effic., Stillwell, Apr 22; distrib. by alt. curs., Kennedy, 22, May 6 \* 20 \* 27; hist. of tension-reducing \* May 27; Perry, June 3; tests, Hopkinson report (full) \* July 1; effic. at different frequencies, Ayrton, Sumpner \* Sep 23, imps. \* 23; alt. cur., expts., Fleming (full) \* Dec 2-30; Ferranti (full) 30-92

*El Rev* new system, Tesla \* June 2-88; Ryan, Dec 28-89; effic., Humphrey (full) \* July 5-90; German cur. \* June 20-91; relation of size and effic., Stillwell, Mar 5; 17,500 watt, test report, diag. Oct 1-92

*El Wild* alt. cur., Kapp \* Mar 17, 24; contin. cur., Sellon \* May 5; new system, Tesla \* June 2; points in distrib. by Gutmann \* Oct 13-88

*El Wild* E. Thomson's method of reg. cur. or poten. in secondaries of \* Apr 13; Kapp regulating \* May 4; and Ganz alt. machine, Forbes \* 25; Picou, Sep 7; Paget's alt. cur. \* Nov 16; tests, Ryan (full) \* Dec 28; design of commercial, Swinburne, 28-89 \* Jan 11, 25, Ryan, discuss. 11; effic., Humphrey (full) \* July 5; distrib. by, from cen. and eccen. stations, Ganz system, Fleming (full) 26 \* Aug 2-30, Sep 6 \* Oct 25 \*



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### Electric TRANSFORMERS

Nov 1-15, 29 \* Dec 6, 27-90 \* Jan 10, 24, 31 \* Feb 14; mag. circuit of, closed or open, Evershed, Mar 21 \* 28 \* Apr 4, 18, 25 \* May 2, 9, 28 \* June 6; distrib., Swinburne \* Mar 21, 28 \* Apr 4, 11-91

*El Wld* relation of size and effic., Stillwell, Mar 5; effic., Dobrowolsky \* May 28; the Rowland, July 9; Westinghouse 6,500 watt, test, Hopkinson \* 16, 23; test of 17,500 watt Stanley, Ryan \* Oct 1; effic. at different frequencies, Ayrton, Sumpner \* 8, 15; hysteresis measurement in, Evershed \* 15, 22; universal, Appolonj \* Dec 10; alt. cur. expts., Fleming \* 24-92

*Eng* pats., ed. Mar 8-89; interference with alt. curs., Ayrton, Mar 27-91; Haskin's, bk. n *E News* Sep 29-92; alt. cur., Kapp *The Eng* Feb 10-24-88; alt. cur., Fleming, bk. review, Aug 26-92

TREE felling machine *Sc Am Sup* \* Mar 2-89, *Industries*

UNDULATIONS, Hertz's expts., Bertolini *Eng* \* Dec 12-90. See also ELEC., Hertz's

UNITS, Crocker *El Eng* Dec 31-90; Brit. Assoc. Oct. 14-91; the volt, ohm and ampere, Nipher *El Rev Lond* \* Apr 27; ohm det., Wuilleumier, July 13; nomen. Dec 7-88; and standards, Pellet report, Sep 13, 20-89; com. report, Sep 26, Oct 10-90; of measurement, absolute, Moon, May 1; and standards, report, Oct 16, discuss. 30-91; nomen., Lodge, Aug 12-26-92; Crocker *El Rev* Jan 3; and standards, report, Oct 3-91

*El Wld* the volt, ohm and ampere, Nipher, Apr 7-88; standards, Pellet, Sep 7, and measures, Internat. Elec. Con., Paris (full) 21-89; of present and future, Crocker, Jan 3; Kimball (full) \* 17-31; and mag., absolute dimens., Rodgers, May 2; and standards, com. report, Sep 26-91; do. Brit. Assoc. Sep. 8-92

*Eng* ohm, Glazebrook, Jones, Sep 26-90; new det. of ohm *Sc Am Sup* \* Feb 16-89; of present and future, Crocker, Apr 11-91; (terms) *St R* / Oct -89; and mechan. *E & Min* Aug 9, *The Eng* July 4-90; electro-magnetic, Nov 27-91; standards, com. report, sup. Dec 9-92. See also ELEC. ampere — ohm — standards — volt — watt, etc.

VACUUM discharge streamers action, Pupin *El Eng* \* Apr 20 92; tube discharge, Tesla *El Wld* ? June 10 \* July 1-91



**Electric VOLTMETERS** *El Eng* the copper, Anderson, Oct -88; spiral coil, Ryan \* Dec -89; best dimens. for standard, Kennelly, Nov 12, 19-90; Weston direct reading alt. and contin. cur. \* Dec 16-91

*El Rev Lond* portable, for measuring alt. poten. differences, Ayrton (full) \* Jan 13-27-88; Ayrton & Perry's hot wire \* Mar 8; spiral coil, Ryan \* June 28; W. Thomson's chain of electrostatic, Meikle \* Nov 8-29-89; Ayrton & Perry's twisted strip \* May 2-90; Sankey \* Nov 27, Dec 4-91; Weston's \* Jan 1-92

*El Wld* for measuring alt. poten. differences, Ayrton, Perry \* Jan 28, Feb 4, 11; portable, do. Mar 10; Weston's \* Nov 17-88 \* Feb 2; instrums. for measuring high potens. \* 9; Ayrton & Perry's \* Apr 6; spiral coil, Ryan \* June 1-89; Ayrton & P's twisted strip \* May 24-90; Weston, as a testing instrum., Merrill \* May 21-92; and ammeter combination, A. White (full) \* *Soc Arts Mass* -90

**WATER** conveyor, Bailey's, n *El Rev* \* Aug 2-90; purification, Stanley-Quackenboss pat. *E News* May 17-90

**WATTMETERS**, Thomson recording *El Eng* \* Nov 5-90 \* June 17-91; corrections to readings, Danielson *El Wld* \* Mar 5, do. Friese, do. May 21-92; for alt. curs., Ganz *Eng* \* Apr 5-89; abs. *Inst C E* v 94 -88, *Cen Elek* -88

**WAVE** and phase indicator, for alt. and undul. curs., E. Thomson *El Rev Lond* \* Feb 3-88; waves, mechan. actions, Hertz *El Wld* \* July 25-91; propagation through wires, Hertz \* Oct 12, *El Eng* Dec, (full) *Sc Am Sup* Oct 19-89

**WEIGHING** machine, the Snelgrove *El Rev Lond* \* Aug 16, *El Rev* Sep 7, *Eng* \* June 21-89

**WELDING** *Am M E* Woodbury v 10 -89; *Am Min* E. Thomson v 19-91; and metal working, Wood, v 20 -92; *Cassier's* welded projectiles, Maxim \* Oct -92

*El Eng* aut. machines, Lemp (full) \* June 4; E. Thomson, Oct 8-90; practical aspects, Perrine, May 27-91; *El Rev Lond* \* Jan 6; E. Thomson \* Nov 16-88; Benardos system, Jan 1-92; proc., Lodge on, Varley (full) July 18, *Industries* June 27-90

*El Rev* Woodbury, Oct 27, tests, table, Nov 3-88; aut. machines, Lemp (full) June 7; applied to manuf. of projectiles, Wood, Nov 1-90; practical aspects, Perrine, May 30, discuss. June 13; Okonite Co's plant \* Oct 24-91, welded projectiles. Maxim, Aug 6-92



**Electric Welding**

*El Wld* Benardos', by means of the arc \* Feb 25; tests, table, Dec 1-88; Thomson's \* Feb 9-89; aut. machines, Lemp (full) \* June 7; Coffin's incand., new method \* Sep 20; E. Thomson, Oct 11; in projectile manuf., Wood, Nov 15-90; pract. aspects, Perrine, May 30, E. Thomson, June 6-91; Benardos' system, by elec. arc \* Jan 16; in wire indus., Bullard, abs. Mar 12; and metal working, Royce, Nov 12-92

*Eng* Benardos' system \* Dec 25-91, do. St. Petersburg \* Jan 27; Thomson's \* Dec 14-88, do. Fish, Oct 4-89; *E Mag* Pope \* July -91; *E & Min* Thomson's, n \* Nov 17-88 \* Feb 9; Howe's Metallurgy of Steel (bk.) sup. May 11-89; arc \* Sep 13; aut. machine, Lemp \* Nov 29-90

*E News* Benardos' method, Apr 7; proc. \* May 5-88; Thomson proc., expts. Mar 9, 23; fibrous structure of elec. welds \* Sep 14, 21-89; Fish, Jan 18; (full) \* Nov 15-90; pract. aspects, Perrine, June 6-91; *E Rec* Woodbury, Nov 17-88

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*R Gaz* Woodbury, and discuss., abs. Nov. 2-88; wire cable, Stuart, Bullard, July 19; of rails, Ries, cor. Sep 27-89; of projectiles, Wood, Nov 7-90; cost, May 1; uses, Perrine, 29, E. Thomson, discuss. June 12-91; elec. blow-pipe, Sheldon *Sci Am* Feb 2-89

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*The Eng* Thomson's machines, Paris exhib. July 5-89; ed. Feb 21, cost, n 28; Bramwell, Apr 18; Woodbury, June 27; arc C. L. Coffin, n \* Sep 12; of projectiles, Wood, Dec 5-90; Benardos-Howard proc. \* Dec 25-91, machine \* Feb 26-92



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*El Rev* arc light, Leggett, Mar 3, 3; N. Y. Bd. Elec. Control (full) July 28; disrupt. discharges relation to, Acheson, sup. \* Sep 8; and overhead, Wheeler \* 15-88; Brooklyn commission report, Jan 5; Johnstone conduit system \* Feb 23, 23; com. report, Mar 2: N. Y. arc, Wheeler, Apr 20-89;



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addr. June '91, v 12 -91, N. Y., R. W. Hunt, Pres. addr. Nov. '91, San Fran. May '92, v 13 -92; *Cassier's* \* Dec -91

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*E News* May 19, 26, Oct 27, Nov 3-88, May 24-24-90, Prov. June 20, 27, ed. Nov 21-91, Dec 8-92; *E Rec* June 20, 27-91, Dec 10, *Iron Age* \* Dec 8-92; *Pwr* July -91; *R Gaz* May 11, 25, Oct 19-88, Erie, May 24; \* Nov 22, 29-89, Cincin. May 23; Nov 14, 21-90; Prov. June 26; Nov 20, 27-91 \* Dec 2, 9-92

AM. Inst. Mining. See MINING engineers

CANADIAN Soc. Civil pors., Houghton *Cassier's* \* Nov, inset \* Dec -92 \* Jan -93, pors. *El Rev* \* Aug 29, pors. *El Wld* \* Sep 12-91

CITY, duties of, ordinance, Salt L. City, Utah *E News* Aug 30 -90

CIVIL. See ENGINEERS, Am. Soc. Civil — Canadian

CLUB of, Phila. pro. *E News* June 30-88

ELECTRICAL. See ELEC. engineers

ENGLISH societies, notes, cor. *E News* Mar 15-90

FRENCH gov't. *E News* Oct 25-90

GERMAN Soc. pro. *Eng* Sep 5-90

INST. Civil, London, pro. *Eng* Nov 15-89, Oct 17, bk. n Nov 21-90, May 29, Nov 13-91, review, Dec 30-92; *E News* June 30-88, benevolent fund of, July 26, history, ed. Dec 6-90; *Inst C E* building v 94 -88, an. report, v 98 -89, v 102 -90, v 106 -91; v 110 -92; *The Eng* open hearth steel for boiler making, Jan 20; Mar 2, 16, Apr 6, May 11, bk. n Nov 16, 30, Dec 7-88, Pres. addr. Nov 15-89, Mar 14, 21-90, Nov 13, 20 -91

INST. Mechanical pro. *Eng* Feb 10, 17, May 11, Carbutt, Pres. addr. Aug 3, 3, 10, 10 \* 31; Nov 2-88, Feb 1-15, Pres. addr. May 10, 10, 24, July 5, 12, Nov 8-89, Jan 31, Feb 7, Tomlinson, Pres. addr. May 9, 9, Aug 1, 8, Oct 31, Nov 7-90, Feb 6, Mar 27, May 8, June 31, Aug 7, Oct 30, Nov 6-91, Feb 12, Anderson, Pres. addr. May 13, 13, 20, July 29, Aug 5, Oct 28, Nov 4 -92

*E News* Aug 16, 23-90, an. meeting, Feb 21, Aug 22-91,



**Engineers, INST. Mechanical**

an. Feb 27-92; *Inst M E* list, by-laws, etc., Cochrane, Pres. addr. May -89, Tomlinson, Pres. addr. May -90, list members, Oct -91, Anderson, societies' prog. May -92; *The Eng* Aug 3, in Ireland, 10, 24-88, Paris exhib. July 5, 12-89, Tomlinson, Pres. addr. May 9-90; July 31-91, Anderson addr. May 6; July 29, Aug 5, Oct 28, Nov 4-92

MECHANICAL, advice to young, Perry *Sc Am Sup* \* Sep 1-88.

See also ENGINEERS, Am. Soc. Mechan — Inst. Mechan.

MUNICIPAL. See MUNICIPAL engineers

WATER-works, the practice of, ed. *E News* Mar 22-90

**Engine** room, experience, Lyne *Am M E* \* v 10 -89; appliances *Pwr* \* Jan - July \* Sep - Dec -90 \* Jan - Apr \* June - Dec -91 \* Jan - Dec -92; telegraph, Thackeray & Hurn's *The Eng* \* Jan 17-90

**Engines, Am C E** wastes, Thurston \* v 23 -90; *Am M E* steam consumption at various speeds, Denton-Jacobus \* v 10; non-condens., cost of power, Emery \* 10-89; Hirn & Dwelshauver's theory of. Thurston, v 11; transmiss. of force in, general solution, Jacobus \* v 11 -90; limitations of economy, Nagle v 13; econ. and effic. of, Peabody, v 13 -92; aut. economics of, Thurston *Cassier's* \* Nov -92; principles and development, Dickerson addr. (full) *El Rev* \* Jan 26, Feb 16-89

*Eng* heat in the, Dwelshauvers-Dery, Donkin \* July 27; for elec. light, Glasgow exhib. \* Aug 3-88; theory of the, ed. Mar 29, Apr 12 \* May 31, June 21, 28; stationary, Paris exhib. Aug 16-89, hor. do., inset \* Jan 3; Fairfield works, Govan \* Sep 26 \* Oct 3, 24 \* Nov 21 \* Dec 12; small, econ. of. ed. Nov 14-90; stationary practice in Am., Stanwood \* Jan 2, 16, 30 \* Feb 20 \* Mar 13 \* Apr 17 \* May 1, 8, 29 \* June 12, 26 \* July 10-91; Thurston, bk. review, Sep 2; heat distrib. in \* Nov 25-92

*E Mag* the prime mover. Iredell \* July -91; steam and development of power by the steam engine, Isherwood *F Inst* Oct, Nov -90; economics of aut., Thurston, insets \* Oct -92; vel. variations, cyclical, Ransom, inset *Inst C E* \* v 98 -89; 2000 h.p., Warren, R. I. *Pwr* \* June -89; new developments in eng., Rockwood. June -92; econ. of non-condensing, Wilans, trials *R Gaz* Apr 6-88; thermodynamics of, Peabody, bk. review, table, June 26-89

*Sc Am Sup* mod. improvements, S. A. Smith, Mar 17-88; the principles and devel., Dickerson \* Feb 23-89; manage-



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- ment \* Apr 26; 100 h.p., for elec. lighting, Berlin \* May 17-90; the builders of, Thurston, May 16, 23-91; theory of *The Eng* July 6, 20; Nottingham Show, July 13-88; Cotterill, bk. review, Dec 26-90. See also AMMONIA — ETHER — HOT air — MARINE — MILL — PETROLEUM — PUMPING — ROAD — ROLLING mill — ROTARY — TRACTION — WINDING — engines; LOCOM. AIR pumps and condensers, Towler *The Eng* \* Apr 29 \* May 13 -92
- AM. high speed *El Rev* \* Mar 5, *E & Min* \* Mar 5, *Pwr* \* Mar -92. See also ENGINES, high speed
- BEAM, Whitbread brewery, Boulton & Watt, 1785 *Eng* \* July 27 -88
- BELGIAN, inset *The Eng* \* Jan 16, 16-91
- BRAKE, the Appold, expts. *The Eng* Jan 13, 20-88, Dec 2-87, Schonheyder, cor. *Eng* July 28-76
- BREAKDOWNS, Sweet *Cassier's* Nov -91
- BURGIN high speed *R & Eng* \* Jan -90
- COLLIERY, econom. use of steam in, McLaren, trials *The Eng* July 17-91
- COMPOUND *Am M E* performance of a, Barrus, \* v 9 -88; use of for manuf., Main \* v 10; cyl. ratios of triple-expansion, Whitham \* v 10 -89; philosophy of the multi-cyl. engine and its limitations, Thurston, v 11 -90; single-acting, Bole \* v 12; test of a trip-expan., Henthorn \* v 12; applic. of Hirn's anal. to multiple-expan., Peabody, v 12 -91; two-cyl. vs. multi-cyl. engines, Green-Rockwood \* v 13; steam distrib. in single-acting, Rites \* v 13 -92
- Cassier's* philos. of multi-cyl., Thurston, Nov; trip-expan., effect of compression on shaft friction, Alden \* Nov -91; trip-expan. experimental, Peabody \* Mar; tandem, New Haven Elec. L. Co. \* Apr; steam distrib. in single-acting, Rites \* May; with Proell valve gear \* Aug -92; Strong trip-expan. (vertical) *El Eng* \* Sep 28, do. *El Rev* \* Oct 15-92; Jonson's stationary (vertical) *El Wld* \* Sep 7-89; the Triumph \* Feb 15-90
- Eng* Guinness grain stores, inset \* Feb 3; and non-compound, steam consumption of, trial, Willans, Mar 16; hor., Glasgow exhib. \* Nov 9; hor., Whitbread brewery, inset \* 30-88; vertical, valve gear \* May 31; hor., Sulzer, Paris exhib. July 26, inset \* Oct 11; tandem, Frikart system, do., inset \* Aug 23, hor., inset \* Sep 6, 6, inset \* Nov 22-89; Corlis hor. do. \*



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Feb 14, trip-expan. hor. do. \* Apr 4, 11; Lyon's slide valve \* May 16; hor., Frikart valve gear, inset \* June 20-90; Kaiser-I-Huid cotton mills, Bombay, inset \* May 8; trip-expan. experimental, Allis \* Aug 14-91; 1600 I. h.p. tandem, inset \* Nov 25-92

*E News* non-condens., steam consumption of simple and, Williams, May 5; Westinghouse aut. \* 5-88; Jonson's balanced \* May 4-89; Strong's 250 h.p. trip-expan. vertical \* Sep 22; steam distrib. in single-acting, Rites \* Oct 20-92

*F Inst* philos. of, Thurston, Dec -89, of multi-cyl., do. Jan \* Feb -90; the Triumph *Pwr* \* Mar -90; trip-expan. vertical \* Mar -91; Strong's do. \* Oct -92; the Woolf *R & Eng* \* Apr -88; Willan's trip-expan. \* Aug -89, do. central valve *Sc Am Sup* Jan 19-89; quad-expan. mill \* Dec -92; Westinghouse *R Gaz* \* May 4-88; steam distrib. in, Rites \* May 27-92; trip-expan. experimental, Peabody, Hirn's anal. *Tech Q* \* Oct -91

*The Eng* 200 h.p. hor., Crompton, Jan 20; portable self-propelling, Cooper, Apr 27; hor., Glasgow exhib. May 4, 4; trunk air-pump, str. Hector, June 8; a new tandem, Turner, July 20, 20; triple semi-port., Nottingham Show, 27; 800 h.p. tandem, with Proell gear, Sep 7, 7; Willan's trip-expan. central valve, Dec 14-88; 400 h.p. condensing, Brussels exhib. \* Feb 22; 350 h.p. Carel's, July 5; trip-expan., with Corliss gear, 26; tandem, Berlin elec. station, Sep 6; the Globe \* Nov 29; 400 h.p. Sulzer \* Dec 6-89

*The Eng* trip-expan French, Paris exhib. \* Jan 10, 10; Fives-Lille condens., do. \* Mar 14, 14; str. Hercules, 1830, inset \* Mar 21 \* Apr 11, gear \* May 2; and trip-expan., ed. 9; Watt's, 1820 \* June 27; 250 h.p. vertical \* Aug 22, 22; 2000 h.p. condens. \* Oct 8-90; trip-expan. vertical condens. for elec. lighting, inset \* Feb 6, 6; Corliss mill \* Mar 13, 27; 1000 h.p. trip-expan. mill \* Aug 7-91; 1000 I. h.p. do. Indian Midland R. \* Aug 26-92. See also AIR compressing — BLOWING — MARINE — PUMPING engines, etc.

COMPOUNDING centrif. and load governing by rotary piston valve, Aldrich *Am M E* -92

CONDENSERS, Kinealy *Sc Am Sup* Mar 16-89, *J Assoc E Socs.* See also CONDENSERS

CONNECTING rods, Mattes *Am M E* \* v 9-88. See also LOCOMOTIVES, conn. rods



**Engines**, CORLISS econ. of compound and single cyl., Jacobus *Am M E* \* v 12 -91; cut-off and compression in, Stanwood *Cassier's* \* Jan; valves adjusting, Pray \* Feb -92; 2500 h.p. mill *Eng* \* Mar 23, inset \* Apr 6, 6; hor., inset \* Apr 20-88 \* Jan -89; hor., Paris exhib. \* Feb 14-90; cut-off and compression, extending range of, Stanwood \* Dec 18-91; with non-detaching gear \* Aug 26-92

CRANK pins, method of securing, Collins *Am M E* -88; crank device, Micheles *Eng* \* July 10-91; crank angle for max. vel. of piston \* July 15-92

CYLINDER condensation, of steam in, surface condensers, Whitham *Am M E* -88; effect of steam jacket on, Bird \* v 12-91; thermo-elec. method of studying, Hall *El Eng* \* June 24, do. *El Rev Lond* \* July 3, do. *El Rev* \* June 27, do. *El Wild* \* June 20-91; Conover condenser *El Rev* \* July 30-92; condensers, theory, Dwels.-Dery *Eng* Sep 13; action of steam in, expts., English \* Nov 8, 15-89

*Inst C E* glass ap. for rendering visible effects of, Donkin, abs. v 97 -89; *Bul Soc Mul* -89; heat expenditure, the cyl. heated externally by gas-flames, Donkin, expts., inset, do. Dwels.-Dery, Unwin trans. (full) *Inst C E* \* v 98 -89; cyl. walls temp. taking at different depths in the metal, Donkin \* v 100 -90; thermal action of cyl. walls, Dwels.-Dery, abs. v 103 -91, *Bul Soc Mul* Aug, Sep -90; movement of heat in, Kusch, abs. *Inst C E* v 107 -92, *Zeit deut Ing* -91; and re-evap., expts., English, insets (full) *Inst M E* \* Oct -89, initial condens., during admission, do. May -92; thermo-elec. method of studying, Hall, *R & Eng* \* Feb -92, *Am Inst Elec Engrs*

*The Eng* ed. Dec 21-88; theories of, ed. Mar 8; Donkin's co-efficient, ed. 29; and re-evap. in jacketed cyl., expts., English \* Nov 8-89; cyl. walls temp. cal., Donkin, diags. \* Sep 25 \* Oct 9; thermo-elec. method of studying, Fitz-Gerald \* Oct 16 -91; expts., Donkin, ed. July 15; Dwels.-Dery, cor. Aug 26, Sep 2-92

CYLINDERS, proportioning, Thurston *Am M E* v 9 -88; two cyls. vs. multi-cyl. engines, Green & Rockwood -92; deposits anal., Stillman *Cassier's* Nov -92; action of steam in, expts., English *Eng* \* Nov 8, 15-89; expts. on temp. of metal, Donkin, inset *Inst C E* \* v 100 -91. See also ENGINES, cyl. condensation.

DIRECT connected, Werner *Cassier's* \* June - Sep -92



**Engines, DODD's high-speed *Eng* \* Oct 5-88**

ECLIPSE Corliss, Frick Co. *The Eng* Mar 30-88

EFFICIENCY, the ideal compared with the real, Thurston *E News* \* July 4, do. *Am M E* \* v 12 -91; and econ. of, Peabody \* v 13 -92; Dwels-Dery *Eng* Feb 21; standard, Bodmer, Mar 7, do. Elliott, cor. 21-90; *Locom* Dec -88; Dery, cor. *The Eng* Oct 25, cor. Nov 1-89; standard of \* Feb 7, 21, Mar 14, Apr 25-90

ERIE City aut. cut-off *Pwr* \* May, *R & Eng* \* May -88

EXPERIMENTS. See ENGINES, tests and trials

FISHKILL Corliss, with Cite's releasing valve gear *Pwr* Aug -88 \* Aug -90

FLY-wheel, novel, Manning *Am M E* \* v 13 -92; and govts., Dwels-Dery, Donkin *Inst C E* \* v 104 -91, do., Ransom, insets \* v 109-92; breakage at Amoskeag mills, Manchester, N. H. *Pwr* \* Nov \* Dec -91

FOUNDATIONS *Pwr* \* Apr \* May -91

FRICTION, internal, of non-condensing, Thurston *Am M E* \* v 9 -88, abs. *Inst C E* v 92 -88 *E News* May 26-88; speed and work, variable load and internal friction, do. *Am M E* \* 10-89, expts. *R Gaz* \* Dec 28, (full) *Sc Am Sup* \* Oct 27 \* Nov 3-88; distrib. of internal, do. *Am M E* v 10 -89 *Eng* \* Jan 4-18-89 *F Inst* \* Nov, (full) *Sc Am Sup* Nov 10, 17-88; of slide valves, ap. for testing, Aspinall *The Eng* \* Mar 22-89

GOVERNORS, J. M. Smith, a use for inertia in shaft govts., Armstrong *Am M E* \* v 11 -90, do. *E News* \* July 19-90; governing of engines, Aldrich *Cassier's* Sep -92; Wilby supplementary *Eng* \* Apr 20-88; action, new method of investigation, Dwelshauvers-Dery, Longridge, trans. *Inst C E* \* v 94 -88 \* v 110 -92; speed regulators, Marie abs. v 93 -88 *An Mines* \* 12-87; the Westinghouse *R & Eng* \* July -91; Tyrrel's *The Eng* Dec 28-88; Nadberg's aut. cut-off \* Sep 18-91

GRABNER'S, combined piston and valve *E News* \* Oct 26-89

HIGH-speed, comparative fuel econ. of, Barius, etc., discuss. *Am M E* v 9-88; high and low speed, Church, Powers *El Rev Lond* Aug 17, *El Eng* Apr 13-88; P. Atkinson *Lehigh Eng J* Feb -89; Rigg's revolving *The Eng* Jan 27-88

HISTORY, early *Cassier's* \* Nov -91; 50 years ago, number, etc., ed. *R & Eng* July -88

INDICATOR diagram, Emery *Am M E* \* v 9-88; motion device, Jacobi \* v 10 89; rigging for compound engines, Par-



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sons, length of card, Webb, the comparison of indicators, do. \* v 11 -90; the Tabor *Eng* \* June 7-89; errors of *E News* \* Feb 9-89; the Perry \* Sep 5-91

*Pwr* indicating \* Aug - Oct -88 \* June - Aug \* Nov -89, comparison, Webb \* Jan, Feb -90; files to \* Dec -92; Bagshaw's diagram meter *The Eng* Aug 24-88; the Tabor, July 19; combined diags., Gill, cor. Aug 23, Campbell, 30 \* Oct 11-89. See also INDICATORS, continuous, etc.

KIMBLE, the *The Eng* \* Oct 2-91 *Pwr*

LIDBACK's vibrating *F Inst* Oct -88

LYON's compound slide valve *Eng* \* May 16-90

MC EWEN aut. *El Wld* \* Apr 16-92

MOTOR, an alleged new, Lautreppe *E News* Jan 7-88

NOBLE's vertical *The Eng* \* June 20-90

PHILADELPHIA Corliss *Pwr* \* Jan -92

PISTON packing, new principle in, Sweet *Am M E* \* v 9 -88; friction of packing rings, Denton \* v 10 -89; rod packings *Pwr* \* Jan -88; rod breakages, report *R & Eng* \* Nov -90

PORTABLE, with removable fire-box and tubes *Eng* \* May 10-89; semi-portable trip-expan. *E News* \* Aug 11-88; how erected *The Eng* \* Sep 11-91

PYLE aut. and dynamo (multiple cyl.) *El Wld* \* Aug 29-91

RIGG's high-speed revolving *The Eng* Jan 27-88

ROBB-Armstrong, n *E & Min* \* Sep 10-92

SHIPMAN aut. *The Eng* July 27-88

SLIDE valve diagrams, Thallmayer, cor. *Eng* \* Mar 15-89; balanced slide valves, Park, inset *Inst C E* \* v 98-89; Aetna balanced *Pwr* \* Oct -90; friction of, ap. for testing, Aspinall *The Eng* \* Mar 22-89. See also ENGINES, valve gears

SPEED register, Duveau's *Eng* \* Sep 27, *Sc Am Sup* \* Nov 9-89; regulators, Marie abs. *Inst C E* v 98 -88 *An Mines* v 12 -87; speed and work, Thurston *Am M E* \* v 10 -89, expts. *R Gas* \* Dec 28, (full) *Sc Am Sup* \* Oct 27 \* Nov 3-88; Corliss valves setting *Pwr* \* Mar -90 \* Nov -92; valves \* June -90; Child's piston *R & Eng* \* Jan -89; valves, Hawley *Sc Am Sup* \* Jan 31 \* Feb 14-91. See also ENGINES, governors — high-speed

STEAM jacket, authorities on, Thurston *Am M E* v 12 -91, do. Donkin *Inst C E* v 104 -91; influence of, Kent *Cassier's* \* Dec -91; Dwels-Dery *Eng* Dec 13-89; econ., notes from an



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eng. lab. Dec 25-91; value, com. report, Oct 28, Davey, 28, Nov 4, expts. \* Dec 9-23-92, do. (full) *Inst M E* Oct -89; max. effic., Thurston *F Inst* \* Apr -91; effic., ed. *The Eng* Nov 28-90; value, com. report, Oct 28-92.

STRAIGHT Line, 100 h. p. *El Wild* \* Aug 24-89

STRONG's trip-expan. vertical *El Eng* \* Sep 28, *El Rev* \* Oct 15, 250 h. p. *E News* \* Sep 22, *Pwr* \* Oct -92

SULZER, Brussels exhib. *The Eng* Aug 17-88

TESTS and trials *Am M E* of several types, Carpenter \* v 11-90; compound trip-expan., Henthorn \* v 12; applics. of Hirn's anal. to, Carpenter \* v 12 -91; testing, Ihlseng *Cassier's* \* Apr; compound multi-cyl., Green \* May -92

*Eng* Royal Agric. Soc. at Newcastle, Shaw, cor. \* Jan 6; steam consump. of compound and non-comp., Willans, Mar 16; Highland Soc. Show, Nov 16-88; Soc. of Arts, ed. Mar 20; Dulwich College experimental \* Nov 1; at Whitworth eng. lab. trials, Manchester, Reynolds, Dec 18-89; Sulzer type hor. trip-expan. 200 h. p., Schröter \* Dec 5-90; compound, expts., Reynolds *E & Min* \* Aug 9-90

*E News* several types, Carpenter, table, Aug 2-90; econ. of non-condensing, simple, compound and triple, Willans, and discuss., insets (very full) *Inst C E* \* v 93 -88, reply to cor. \* v 96, Westinghouse test, Alley, n v 96 -89; at Whitworth eng. lab., Manchester, Reynolds, and discuss., inset (full) \* v 99 -90

*Pwr* compound, Howland mill, New Bedford, Mass. (full) \* Dec -89; Utica, N. Y. Steam Cotton mills power plant, Carpenter \* Aug -92; econ. of non-condens., Willans *R Gas* Aug 6 -88; expts. at Mass. Inst. Tech., Purinton, general review of tests, Peabody (full) *Soc Arts Mass* -88; Purinton *Tech Q* \* Feb -88

*The Eng* econ. of non-condens., Willans Apr 6; Highland Agric. Soc. Aug 3-88; Soc. of Arts \* Feb 22 \* Mar 1, 8-89; Royal Agric. Soc. July 4-90; colliery, econom. use of steam in, McLaren, July 17-91

THREE-cylinder, Paris exhib. *Eng* July 12-89

UNDERGROUND hauling, Ilkeston colliery *Eng* \* Nov 23-88

VALVE gears, effect of unbalanced eccen. or gov. ball on valve motion, Sweet *Am M E* \* v 11 -90; Proell gear on compound *Cassier's* \* Aug -92

*Eng* Payton's \* Aug 17-88; compound vertical \* May 31;



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hor. engine with Wheelock gear, Paris exhib., inset \* Aug 9; Bremmes' \* Oct 11; radial gears, J. R. Smith \* Nov 22, 29-80; radial gears, Payton, cor. \* Jan 24; Bremme's, cor. \* 24; Frikart gear, comp. hor., inset \* June 20-90; Walker's Corliss, n \* July 24-91; the Zenner valve motion diag. *Gow F Inst* Sep -88; prob., graphic solution, Weihe *Lehigh Eng J* Apr -89

*Pwr* Fishkill Corliss with Cite's releasing gear \* Aug -88 \* Aug -90; link motion, Lyne \* Apr, June -89; Corliss valves setting \* Mar -90 \* Nov -92; valves \* June -90; Child's piston valve *R & Eng* \* Jan -89; radial gears, J. R. Smith \* Feb \* Mar, Morton radial \* May -90; valves, Hawley *Sc Am Sup* \* Jan 31 \* Feb 14-91; Proell gear, 800 h.p. tandem comp. *The Eng* Sep 7, 7-88; the Cross gear \* Apr 4-90. See also ENGINES, slide valves.

WESTINGHOUSE aut. compound *E News* \* May 5, *R Gaz* \* May 4-88

**England**, taxation, local expenditure, ed. *Eng* July 26-89; trade relations with Am., McCormick, and ed. Apr 8, 29-92; coal-ing stations, defences of, Hong Kong *The Eng* \* Jan 18, Singapore \* Feb 1, Aden \* Mar 15, Cape of Good Hope \* Apr 5-89. See also BRITISH; GREAT Britain

**English** notes *E & Min* Aug 24, 31, Sep 14, 21, Oct 12, Nov. 23-89. See also GREAT Britain

**English**, Thomas A. *Inst C E* v 97 -89

**Engraving** rail sections, 4 styles, etc., ed. *E News* \* Dec 27-90

**Entomology**, Riley (full) *Sc Am Sup* Jan 17-31-91

**Ericsson**, John *Eng* Mar 15-89, Church, bk. review, Feb 13 91, por., inventions, etc., and ed. *E News* \* Mar 16-89, *Locom* Apr -89, por. (full) *R & Eng* \* Apr -89, life of, Church, bk. review, Jan -91, por *Sci Am* Mar 16, Capt., and his work, 23-89, MacCord (full) *Sc Am Sup* Feb 8-90, *Stevens Indic*, ed. *The Eng* Mar 29-89

**Esparto**. See PAPER, Esparto (fibre)

**Estridge**, Joseph *Inst C E* v 106 -91

**Ether**, elec. and ponderable matter, W. Thompson (full) *El Wld* \* Apr 27-89; first capital operation, Slade *Scribner's* Oct -92

**Ether** engine, Susini's *Sc Am Sup* \* Nov 14-91

**Ethics** and railroad supplies *R & Eng* Dec -89

**Etna**, volcanic eruption *Sc Am Sup* Aug 27 92



**Evaporation** of moisture from various substances, expts., Worrell, table *Sc Am Sup* July 7-88

**Events**, current, monthly record *Harper's* files

**Evolution** *Locom* Aug -89; mental, in man and lower animals, Bodington *Sc Am Sup* Aug 6-92

**Ewing**, J. A., por. *El Wild* \* Jan 17-91

**Excavating** and excavators, Panama Canal, Willans, insets *Am CE* \* v 19 -88; steam, Clements *Am ME* \* v 9 -88; methods and cost of working by steam excavs., Clements *E News* \* May 26, June 9-88; a great rock excav., Tilly Foster mine, Brewster's station, N. Y. \* Apr 20; excavator for sewer trenches \* Sep 27-89; and hoisting machinery, the White, Minn. \* June 6-91; trenching and pipe laying, Fitz Gerald *E Rec* \* June 15; timbering shafts, Croton aqueduct \* Aug 17, 31-89; at Panama canal, Nansouty, abs. *Inst CE* v 94 -88 \* *Genie Civil* \* v 13 -88; Darby broadside steam digger *Sc Am Sup* \* Sep 1-88, *Iron*. See also DREDGING; MINING; SEWERAGE; TUNNELING

**Executions**, methods, n *Locom* Jan -90. See also ELEC. execution

**Exhibitions**, ethics of great, ed. *Eng* July 4-90. See also ELEC. exhibits.

AGRIC. Soc., Royal, Show, Doncaster *Eng* \* June 26; *The Eng* \* June 19, 26-91

AM. Institute fair, N. Y. *Sci Am* Oct 20-88

CRYSTAL Palace Elec. *The Eng* \* July 22-92

EDINBURGH, 1890 *Eng* inset \* Apr 11-25, May 30, June 20 \* July 11, 25 \* Aug 15, 29 \* Sep 19, 26 \* Oct 10; *The Eng* Mar 28, buildings \* May 2-90

FRANKFORT Elec., plan *Eng* \* July 18-90 \* May 8, 22, 29 \* June 5-July 24 \* Aug 7-28, Sep 4 \* Nov 13, *The Eng* \* Sep 18, 25 \* Oct 2-91

GLASGOW Internat. *Eng* Mar 23, plan \* Apr 20, May 4, 25, June 8-29, July 13 \* Aug 3, 10, Nov 9-88, *The Eng* Nov 18-87, Apr 27, May 11, June 1-88

MOSCOW, French Elec. at *Eng* \* Aug 21, 28 \* Sep 4, Oct 2-91

NAVAL, Royal, London *Eng* \* Feb 13, May 1 \* June 5, 12 \* July 17-31 \* Oct 2-16 \* Nov 27 \* Dec 11-25, *The Eng* \* Mar 13 \* May 1-29 \* June 5-26 \* July 10-31 \* Aug 14, 21-91

PARIS, notes *El Wild* Oct 5, 12-89, ed. *Eng* \* Apr 27, May 11, inset \* June 1, 29, ed. July 27 \* Aug 10, 31, ed. Sep 28 \* Nov 2-



**Exhibitions, PARIS**

30 \* Dec 14-**88** \* Jan 4, 25 \* Feb 1, inset (full) \* May 3, ed. 10, 17, 24, \* June 7, 7, means of transport \* July 5-26 \* Aug 2, 16, 23 \* Sep 6, 13, 27, awards, Oct 4, 11, stats. 18, ed. Nov 8, 15, Wood, cor. Dec 13-**89**, diplomas \* Jan 9-**91**, *E & Min* \* May 18 \* June 1-**89**, *Genie Civil*, U. S. elec. exhibits, *Hering F Inst* Jan, May, June, metallur. arts at, Garrison, May, June \* July, Aug \* Oct -**90**; 1889, Machin. Hall erection, Henard, abs. *Inst C E* v 95 -**89** *Genie Civil* \* v 13 -**88**, *R Gaz* May 17-**89**, *Sci Am* Feb 2, 2, Apr 20-**89**; 1889 *Sc Am Sup* \* Aug 4-**88** \* Feb 16 \* Mar 30 \* Apr 27 \* May 25 \* June 8, 15 \* July 13 \* Aug 17 \* Oct 12, 26, awards, Nov 2, 9-**89**, *The Eng* Dec 28, 28-**88** \* May 3, Eiffel tower \* 10, 17, June 14 \* Aug 2-16, awards, Oct 4-**89**

**TASMANIA** *Eng* Feb 6-**91**

U. S., World's Columbian, Chicago, 1893, *Am C E* Gov't building dome ironwork, McGuire, insets (full) \* v 20-**92**; *Century* architecture, Van Brunt, May — Aug; Kirkland *Chaut* Dec -**92**

*El Eng* electricity at, Calkins \* Nov 23-**92**; *El Wld* Electric. bld. plan (large scale) \* Oct 24-**91**, electric. at \* Aug, Sep, Machin. bld. \* Oct 1, electric. at \* Dec 3-**92**

*Eng* Dec 27-**89**, ed. Mar 7, Berger on Chicago, Wood May 2, Berger July 4, Oct 3, Dredge Dec 5, ed. 5, 12 \* 19-**90**, Jan 2, ed. Feb 20 \* 27, ed. Mar 27 \* Apr 17 \* May 1, inset 29 \* June 5, inset 12, ed. 19, inset 26 \* July 10, ed. 17, 24, inset 31, 31, ed. Aug. 7 \* Sep 18, n \* Oct 9, 23, 30 \* Nov 6, inset 13 27, inset \* Dec 4, 4, Dredge, inset 11, 11, 18, 18, 25-**91**; \* Jan 1, Dredge, inset 8-20 \* Feb 5-19 \* Mar 4-25, inset \* Apr 8-20 \* May 6, Gov't. bld. 20, 27 \* June 10, 24 \* July 1-29 \* Aug 5, Dredge, 12, Wood report, 19, 26 \* Sep 2, cost of exhibiting, 9, 16, 23 \* Oct 28 \* Nov 11-25, Transport. bld. \* Dec 2, 9, Dredge, Electric. bld. \* 16-30, Dredge, 30-**92**

*E Mag* mechan. display, Atkinson, Apr; buildings, Freitag \* Nov -**91**, Manuf's bld., greatest of all fair buildings., do. \* July; and death rate of 1893, Bayles, Dec -**92**

*E News* original buildings, ed. Oct 5-**89**, novel plan, Jennison \* Mar 15, ed. 29-**90**, vs. N. Y. City, ed. Aug 10, proposed N. Y. site for, ed. Sep 29-**89**, general plan \* Mar 28 Sep \* 26, birds-eye view \* Oct 31, figures 31-**91** \* Jan 16, n 23, 30, buildings, inset \* Feb 13 \* Mar 5, dome 12, 26, Apr 9 \* 21, Mining



**Exhibitions, U. S., World's Columbian**

bld. inset \* May 5, 12, 26, June 9, Mach. bld. inset \* 30 \* July 7, inset, 28, inset \* Sep 1, 8, transportation \* Oct 13, elec. R., inset \* 20, cars, inset \* Nov 17, Transport. bld. Dec 1, inset \* 29-92

*E Rec* blds. \* June 25 \* July 9, insets \* Aug 6, 13, 27 \* Sep 17 \* Oct 8-22, Machin. Hall details \* Nov 19, 26 \* Dec 24, 31-92; *F Inst* inset \* May -92; blds. foundations and floors, Gottlieb *J Assoc E Socs* Dec -91; the designers of the fair (architects), pers., Millett *Harper's* \* Nov - 92

*R Gas* Oct 3, 11, n Dec 6-89 \* Aug 7 \* Sep 25-91, buildings \* July 1, \* Aug 26 \* Sep 16, 23, \* Oct 14; World's Congresses of 1893, Bonney, por. *Rev of Revs* \* Oct -92; *Sc Am Sup* (full) Feb 15-90; Dredge (full) Jan 3, tower \* Apr 4, \* Aug 29-91; making of the white city, Bunner *Scribner's* \* Oct; Chicago's part in, Mac Veagh, Nov; decoration of, Millett \* Dec -92

*The Eng* \* July 31 \* Aug 14 \* Sep 18, battleship Oct 16, regulations 16 \* 23 \* Nov 6, 13, 20, 27, 27 \* Dec 25-91 \* July 1, 22 \* Aug 12 \* Sep 9, 23, general plan \* Oct 28-92

**Explosions** from unknown causes, Bayles *Am Min* v 19-91, do. Green, v 20 -92; under water *Eng* \* Mar 22-89; of dynamite on the schooner Parallel, Le Conte *R Gas* Aug 2-88. See also BOILERS, explosions, etc.

**Explosives**, historical notes, Guttman *Eng* Nov 8-89; expts., So. Wales mining, Sep 12-90; firing point table, n *E Mag* Apr -91; value of hydrocarbon explosives for mining, Walker *E & Min* Aug 11-88; modern, Deering, Feb 23; high, notes, Dec 28-89; use of in fiery mines, Nov 29-90

*E News* high, list of. Mar 31; and their composition, Foster, list, June 30, July 7-88, classification of, do. Jan 12, high, properties and use of, July 6-89; relative strengths of high, Walker, Jan 31-91; high, in warfare, Barber *F Inst* Feb -91; employment in presence of fire-damp, report, abs. *Inst C E* v 99 -90, *An Mines* v 14 -88; and ordnance material, Emmens, abs. *Inst C E* v 108 -92, *U. S. Naval Inst* pro -91; Deering *R Gas* Feb 15-89

*Sc Am Sup* high and projectiles, Vreeland, Dec 1-88; Deering (full) May 18, *J. Soc Arts Lond*; recent develop. in high, Nursey (full) *Sc Am Sup* July 20, 27; notes, Hake (full) Oct 5-89; high, in warfare, Barber, May 21-91; Lippincott, Oct 1 -92; drying ap. in vacuum *The Eng* \* Nov 27-91, July 1-92



## 158 EXPLOSIVES, AMMONITE — FALSHAW

**Explosives**, AMMONITE, expts. with *The Eng* July 17-91

AZOIMIDE (new sodium salt) *Sc Am Sup* Jan 9-92

BELLITE, expts. *Eng* Feb 8-89; *E & Min* Dec 1-88, *Iron*; Favier and Roburite *E News* Apr 25-91; Chalon, abs. *Inst C E* v 94 -88, *Genie Civil* v 13 -88; *Locom* Mar 89; *Sci Am* Dec 1-88; *The Eng* Nov 9-88; expts. Feb 8-89

CAKE-powder, perforated, for ordnance, Quick, abs. *Inst C E* v 97-89

CARBO-dynamite *Eng* Apr 20, *Sc Am Sup* May 19-88

EMMENSITE *E News* Feb 2-89, n *Sc Am Sup* Jan 7-88, *Am Engr*

GUN-cotton, hist., manuf., Rohrer *Sci Am* Feb 23-89

GUN-powder, blasting, form of crater produced by exploding in a homogeneous solid, Firmstone, insets *Am Min* \* 18-90; smokeless *E & Min* July 5-90, *Industries*, do. *E News* July 5-90, do. expts. at Essen, abs. *Inst C E* v 100 -90; manuf., F. H. Robinson *Sc Am Sup* Dec 1-88; improvements in, Abel (full) Oct 18-90; smokeless, do. (full) Apr 12 \* June 28, do., Helene (full) \* Oct 4-90, do. Maxim (full) Sep 26-91

MELINITE disclosures, ed. *Eng* May 29-91

NITRATED manuf., Negrier furnace *Sc Am Sup* \* Jan 30, May 21 -92

NITRO-cellulose manuf., Littlewood *Sc Am Sup* Dec 5-91

NITRO-glycerine and other, tests of relative strength, F. W. Clark *Am Min* \* v 18 -90; manuf., Vuillaume *Sc Am Sup* \* Apr 13 -89

ROBURITE, Favier and Bellite *E News* Apr 25-91

SMOKELESS powders. See EXPLOSIVES, gun-powders, smokeless

**Extensometer**, Johnson's *E News* \* Aug 4-92

**Extract** concentrating ap. in vacuo, Adrian *Sc Am Sup* \* May 25-89

**Eye-bars**, steel, tests, Lewis, discuss. *Am C E* \* v 27-92; tests of full size, n *E News* \* July 14-92

**Eyesight**, care of, Fox *F Inst* Sep -91, June -92, do. (full) *Sc Am Sup* Oct 3-91

**Factory**, elec. driving (full) *The Eng* Nov 25-92. See also MILLS

**Falling** bodies vel., of different spec. grav. falling in water, Richards-Woodward, insets *Am Min* \* v 18 -90, do. insets *Tech Q* \* May -90

**Falshaw**, James (full) *Inst C E* v 99 -90



- Fans**, Walker anti-vibration reg. shutter or slide for, Guibal, and other enclosed fans, Walker *Am Min* v 19 -91; Capell, at Berge-Borbeck, Kattwinkel. abs. *Inst C E* v 103 -91, *Zeit Berg* -90. See also BLOWERS
- Faraday** centenary *Sc Am Sup* \* Aug 1-91; chem. works of in relation to mod. science, Dewar, May 14-92; centenary, Royal Inst. pro. *The Eng* \* June 26-91
- Farey**, Barnard W. *Inst C E* v 94 -88
- Farmer**, what the Gov't. is doing for the, Harris *Cent* July -92
- Farrar**, James *Inst C E* v 98 -89
- Faucet**, an indestructible, W. Thomson's *E News* \* Sep 19-91
- Feed water heaters**. See BOILERS, feed water heaters
- Felton**, Samuel M. *R Gaz* Feb 1-89
- Fermentation** industries, chem. and bacteriology, Frankland *Sc Am Sup* \* Dec 3, 10-92
- Ferranti** and his work *El Wild* \* Jan 2-92
- Ferro-silicon** and econ. of its use, Keep *Eng* Jan 11-89
- Ferry-boats**, the 'Bergen' steam double screw str., Hoboken, Stevens-Denton *Am M E* \* v 11; *Eng* \* Feb 21, 21; performance, do. *R & Eng* Mar -90; *R Gaz* \* Aug 9-89; *Sci Am* Dec 8 -88; *Sc Am Sup* \* Nov 1-90
- BREMEN, screw *Eng* \* Feb -92
- 'CINCINNATI,' screw, Penn. R., inset *E News* \* Nov 7, inset *R Gaz* \* Nov 6-91
- ELEVATING platform *Sc Am Sup* \* Oct 12-89
- FINNIESTON elevating deck str. *Eng* \* Sep 5, *Sc Am Sup* \* Nov 15-92
- FREIGHT car transfer, Penn. R., Jersey City, inset *E News* \* Jan 18, 18-90
- GREENWICH steam, Thames river *Eng* \* Feb 17 \* July 20, *Sc Am Sup* \* Mar 24-88, \* Dec 31, *The Eng* \* Dec 2-92
- HOBOKEN, Gannon *R & Eng* \* Feb -92. See also Ferry-boats, 'Bergen'
- 'MERSEY' str., Liverpool *The Eng* \* Oct 23-91
- MICH. Cen. R. steel str. *R & Eng* \* Feb, *R Gaz*, *Sc Am Sup* \* Feb 23-89
- 'SOLANO,' Cen. Pac. R., Harris, insets (full) *Am C E* v 22 -90
- 'TRANSFER,' Can. So. R., engines, inset *Eng* \* Mar 21, *Sc Am Sup* \* May 10-90
- Ferry-house**, Barclay st., N. Y. *E Rec* \* Nov 24-88
- Fertilizers**, trade report, Terne *F Inst* Dec -92; relation to



**Fertilizers**

fruits, Austen *Sc Am Sup* May 25-89; fertilizing materials, Voorhees, May 3-90; (full) June 13-91; artif, W. S. Allen *Soc Arts Mass* -89

**Fibre** testing instrum., Boys *Eng* \* June 21-89; textile fibres and fabrics, exam, Schlichter (full) *Sc Am Sup* \* May 17-90. See also LIME sulphite fiber manuf.

**Field**, Cyrus W., por. *El Rev* \* July 23-92

**Field**, Stephen D., por. *El Wld* \* Dec 28-89

**Figures**, curiosities in *E News* Dec 29-88. See also ARITHMETIC

**Finance**, Inst. of Actuaries, Text-book of Prins. of Interest, Life Annuities and Assurances, King, bk., C. & E. Layton, Lond '87; English currency commissions arguments *E & Min* Nov 24-88

**Finland**, canals, roads and railroads of. See CANALS, Finland.

**Fire** alarms, Denio system *El Eng* \* Oct 5-92; the Rogers auxil. *El Wld* \* Oct 13-88; Gaynor system \* May 11-89; N. Y. service, n \* Nov 28-91

**Fire-boats**, N. Y. city *E & Min* Apr 12-90; Cowles, abs. *Inst C E v 92* -88, *Am M E* -87, for City of Chic., do. *The Eng* Dec 21-88

**Fire**, Chicago, Kirkland *N E Mag* Aug -92

**Fire-clays**, Am., analyses, table *Sc Am Sup* May 31-90. See also REFRACTORY materials

**Fire** Commission, Howes, Fitzgerald, Fry report, description of depts., N. Y., Chic., Phila., Balt., Cincin., fire losses, table, etc. *Boston Herald* Mar 4-90

**Fire-engine**, Dewey's *El Rev* \* Mar 7-91. See also STEAM fire engines

**Fire** extinguishers, Lufkin's elec. method *El Eng* \* Sep 3-90; Carver's ap. July 7 \* Sep 7-88 \* Feb 15-89; water required, ed. Dec 20-90, do. *E Rec* Jan 10-91; extinguishing, Woodbury, cor. *E News* Jan 11-90; Hexamer's, for malt mills, com. report, n *F Inst* Apr -89; Mackey aut. *Sci Am* Nov 3-88; Met. fire brigade, Lond. *The Eng* Feb 3; Douse's aut. fire-check, Nov 23-88

**HOSE**, linen, quality of *E News* Mar 23-89. See also FIRE streams

**HYDRANTS**, det. of rental value of, Tubbs *E News* May 5-88; and valves, new types, Stillwell manuf. Co. \* Mar 29; Eddy Valve Co. \* Oct 4-90



**Fire INSURANCE** and elec. interests, relations between, Barton *El Eng* May 28, do. *El Wld* May 31; Assoc., Factory Mut. results *E News* Sep 22-88; Bost. Manuf's. Mut. Co's report, n Mar 23-89; rules and elec. lighting, Hartwell *The Eng* Dec 5-90. See also ELEC. insurance, etc.

ISLAND inlet, is it moving E. or W., Haupt, map *F Inst* \* Apr -89

LONDON stats. *El Rev Lond* Jan 18-89; and fire telegraphs, Feb 5-92; Met. fire brigade *The Eng* Feb 3-88

LOSSES, methods of reducing, Woodbury *Am M E* \* v 11 -90, do. *Cassier's* \* Nov \* Dec -91, do. *E News* \* Dec 14-89; and timber supply, diag., ed. Jan 19-89; table, etc., Fire Commission report *Bost. Herald* Mar 4-90; in U. S., 1875-'87, the Chronicle Fire Tables for 1888, bk., Chron. Co., N. Y. *F Inst* Sep -88, do. for 1890, bk. notice *E News* Sep 20-90

New York alarm service, n *El Wld* \* Nov 28-91; dept. *Sci Am* Feb 16-89

**Fire-place** and stove effc., Lunge *The Eng* Sep 6-89, *J Soc Chem Ind*

**Fire-proof** doors *Eng* July 12-89; floors, diag. for det. size and wt. of steel beams for *E News* \* Apr 28-92; fire-proofing, Martin proc., Beardsley *F Inst* Jan -88; construct., Webster, insets (full) *Inst C E* \* v 105 -91. See also BUILDINGS — FLOORS — PAINTS, fire-proof

**Fire**, protection from, hazards from electricity, Woodbury *El Eng* Nov 18, 25-91; rules for elec. wires *El Rev Lond* Apr 13, June 1-88; elec. fires, Barton *El Rev* Oct 4-90

*Eng* fire-proof doors \* July 12-89; elec. lighting dangers, Ferranti \* Jan 3, 10-90; slow burning construct., Woodbury, Apr 10-91; risks on tall office buildings, Atkinson *E Mag* May; ceilings, comparative value of different *E News* Apr 7-88; metallic lathing and ed. \* Dec 7, 7; expert opinions on, 14-89; aut. sprinklers, Apr 28-92

*E Rec* prevention, Chatterton, abs. \* Sep 7, 14-89; resisting construct., Woodbury, Jan 24; prevention and relation of building inspection, do. 31, Feb 7, 14; resisting materials tests, Boston \* Oct 24; hazards for electricity, Woodbury, Dec 19, 26-91; distrib. mains, Fanning, May 21, 28-92

*F Inst* Paris and Am. cities — Phila., Boswell, Feb -90; elec. lighting of danger buildings, Jenkin *Inst C E* \* v 110 -92; electricity as applied to, Lufkin *Sc Am Sup* \* Oct 25-



**Fire protection**

**90**; Woodbury, Mar 14; portland cement as a material, Monier's new use for *The Eng* Nov 27-**91**. See also ELEC. ins.—lighting rules, etc.; FIRE sprinklers; LOCOMOTIVE fire extinguisher

**PUMPS**, steam, Alburger *Cassier's* \* Mar -**92**. See all STEAM pumps

**SERVICE** and distrib. mains, Fanning *Cassier's* July, Aug, do. *E News* \* July 14, do. *E Rec* June 4, arr. of hydrants and water pipes, July 10, 23, Aug 6-**92**. See also FIRE, Lond — Losses — N. Y.

**SPRINKLERS**, aut. *Eng* May 4; Draper-Hetherington aut. \* Nov 16 *The Eng* Mar 9-**88**; aut. *E News* Apr 28-**92**. See also **SPRINKLERS**

**STREAMS**, expts. relative to the hydraulics of, Freeman, and discuss., insets (very full) *Am C E* \* v 21-**89**, pph. do. Nov -**89**, do. *E Rec* Jan 4 \* Feb 1, 22, Mar 8, Apr 26, May 3-**90**, do. abs. *Inst C E* v 101 -**90**; distrib. mains *E News* July 21-**92**  
**TELEGRAPHS** and stats. (Lond.) *El Rev Lond* Feb 5-**92**; Truenfeld, Mar 16-**88**

**Fires** in cities, conflagrations, Woodbury *F Inst* Aug -**91**; prevention and extinction, Chatterton *Inst C E* \* v 93 -**88**; in theatres, abs. v 94 -**88**, *Tech Blatter* v 20 -**88**; peculiar origin of *Sc Am Sup* Feb 14-**88**, *Eng*

**Fish**, displacements and area curves of, Parsons *Am ME* \* v 9-**88**

**Fisher**, George *Inst C E* v 107 -**92**

**Fishery** question, No. Am., Linzee *Tech Q* Feb -**90**

**Flame** and smoke, expts., Fletcher *Sc Am Sup* Jan 26; on flame, Rowan (full) June 8-**89**, *J Chem Indus*; structure and chem. of, Smithells, *Sc Am Sup* Apr 16; influence of air on illum. of flames, Bunte, June 4, *Chem Tr J*; illuminating, Lewes *Sc Am Sup* July 9, hydrocarbon, luminosity, do. Apr 2, Oct 15-**92**

**Flax** culture, and preparation, Stewart *Sc Am Sup* Jan 10-**91**; Monie \* Feb 23-**89**, *Industries*

**Fleming**, John A., por *El Wld* \* Nov 8-**90**

**Flood** gates, aut., Czvetkovics *Eng* \* July 13-**88**

**Floods**, Ravine du Sud, Hayti, averting overflow, Crowell, and discuss., insets, So. Fork dam failure, com. report, insets *Am C E* \* v 24 -**91**; effects in western rivers, Going *E Mag* Sep -**92**  
*E News* through the failure of natural barriers, July 27; Johnstown, Pa., disaster \* June 1, ed. 8, and South Fork dam,



**Floods**

and ed. 15, 15, ed. 22; map of district \* July 13 \* Aug 17-**89**; of June, 1889, West branch Susquehanna river, Pa. \* Feb 14-**91**, do. report, Raymond *E Rec* Jan 23-**92**; Johnstown \* June -**89**; in Germany, causes of, Niles *Soc Arts Mass* -**88**; prevention and control of rivers, Robbins *Tech Q* Sep -**87**; discharge from small watersheds, Porter, inset \* Dec -**91**; Johnstown *The Eng* Aug 30-**89**

**Floors**, fire-proof construct. *E News* \* May 23 \* July 4, Wilson, cor. \* 25, Equit. bld., Denver, Col., three systems, Hawks \* Aug 29, hollow arch-blocks, test, Cutshaw \* Nov 14-**91**; fire-proof, diag. for det. size and wt. of steel beams for \* Apr 28; a monolithic beton-concrete, n \* May 5-**92**; World's Fair blds., Chic. *E Rec* Dec 5-**91**

**Flour mills**, roller milling, Simon *Eng* \* Apr 12, 19-**89**, insets (full) *Inst M E* \* Jan -**89**, *Sc Am Sup* Mar 16-**89**; methods, Gibson, *Sc Am Sup* Mar 3; risks and appliances, Arndt, Aug 4-**88**; mod. products, distrib. of phosphorus and nitrogen in, E. Richards *Tech Q* Aug -**90**; machine, Robinson's *The Eng* \* June 7-**89**

**Flower**, James J. A. *Inst C E* v 95 -**89**

**Floyer**, George W. *Inst C E* v 103 -**91**

**Fluorine**, isolation of, Tutton *F Inst* Apr, *Sc Am Sup* Jan 28-**88**, *Nature*; researches on, (full) do. *Sc Am Sup* \* Dec 12-**91**

**Flying**, mechan. flight, Langley *Cosmop* May; the aeroplane, Maxim, June -**92**; machines, expts., Hargrave *Eng* \* June 6, compressed air \* Dec 26-**90**; expts. in aerodynamics, Langley, bk. review, Nov 20, Vogt, cor. Dec 4-**91**

*E Mag* air nav. prog., Chanute \* Oct -**91**; human, suggestions, Kirk \* Feb -**92**; machine, latest, ed. *E & Min* Jan 11-**90**; the problem of, ed. *E News* Aug 31-**89**, Jan 31-**91**; an aeroplane diagram, Hastings \* May 5-**92**

*R & Eng* machines, Maxim, Jan, June, July; soaring of birds \* Mar; Ader's, n \* Sep; mechan. flight expt. researches, Langley, Sep; machines, prog. in, Chanute (full) \* Oct **91** - Dec -**92**, etc.

*Sc Am Sup* flight of birds, n \* Feb 1-**90**; the Maxim machine \* Aug 22; mechan., experimental researches, Langley, 29 -**91**, do. Oakes \* July 30, aviation. Renard \* 30-**92**; reaction of air on planes, Lancaster, cor. *The Eng* \* Mar 7; Quartermain, cor. Oct 17-**90**; the Maxim machine \* July 17-**91**. See also AIR nav.



**Fly-wheels**, Armer, cor. *Eng* Oct 30-91; band strains in rims, Stanwood *E News* \* Dec 8, *Am M E* \* v 18 -92

**Foam**, Rayleigh (full) *Sc Am Sup* \* Aug 28-90

**Fog**-signalling ap., Paris exhib. *Eng* \* Oct 18-89; aut. marine, Berkeley *Sc Am Sup* \* Sep 15-88; ap. for elec. light in light-houses, see **LIGHT**-houses, fog

**Force**, action of, mod. views and conception of the ether, Stanley *El Wild* Apr 16-92; and energy, a theory of dynamics, G. Allen, bk. n *F Inst* Mar -91; principle of, demonstration of existence of atom, Maxim *Sc Am Sup* May 11-89. See also **ENERGY**

**Forestry** interests of U. S., n *E News* May 31-90; development of, in Europe, Raynor *Lehigh Eng J* June -88; forests of U. S. *Sc Am Sup* Oct 6-88; practical, Lyman, July 2-92

**Forging**, hydr. and flow of solids, C. Sellers *R Gas* Feb 7-90, Dec 25-91

**MACHINE**, spike, the Burton system *El Eng* \* Jan 27-92, *El Rev* \* Sep 13-90; hydr. machines and steam hammers, C. Sellers *R Gas* Aug 2-89; Gould's \* Feb 7-90. See also **STEAM** hammers

**PRESSES**, W. Allen *Cassier's* \* Feb -92; hydr., do. *Eng* \* Oct 9, do. *R & Eng* \* Dec, do. *Sc Am Sup* \* Nov 14-91; Daelen, Demenge, abs. *Inst C E* v 108 -92; hydr., French large *R & Eng* \* Feb -92. See also **STEAM** hammers, Chomienne *R & Eng* Aug -89

**Forgings**, rolled, Gould machine *R Gas* \* Feb 7-90

**Forge** (shop), Cen. engine works, W. Hartlepool *The Eng* \* Feb 7-90

**Fortifications**, and gun-cotton shells *Eng* June 15, 22-88; fortress defence, ed. Jan 25-89; metallurgical arts, Paris exhib., Garrison *F Inst* \* July \* Aug -90; China, scientific, Dowdall, n *Inst C E* v 99 -90; hydrostatic disappearing turret *Sc Am Sup* \* July 14, do. French \* Aug 25-88; the Mongin oscil. cupola, French *The Eng* \* Nov 29-89. See also **GUNNERY** and armor

**Foundations**, experiences, notes, Boller *Am C E* \* Oct 27-92, do. *E News* July 28-92; crushing strength of materials, Baker, table, cor. Jan 5-89; Collingwood, Feb 14, 21-91, do. *E Rec* Mar 30, Apr 6-89, Feb 21, 28-91; new method for, R. L. Harris pat. *Sc Am Sup* \* Oct 1-92. See also **BRIDGES**; **BUILDINGS**; **CEMENTS**; **CONCRETE**; **DAMS**; **HARBOR** eng; **LIGHT**-houses; **PIERS**; **PILING**; **QUICKSAND**, dealing with; **WATER**-works, etc.



- Foundations**, ANCHORING bolts, adhesive strength of sulphur, lead and portland cement for, *E News* July 19-90
- BUILDING, steel for, Chic., Purdy, inset *E News* \* Aug 8-91
- CITY Hall, Kansas City, Mo. *E Rec* \* Apr 2, 16-92
- COFFER-dam or caisson without timber or iron in its construct., R. L. Harris *Am C E* Mar -91, *E News* Mar 7-91, abs. *Inst C E* v 105-91; and floating caissons, R. Hunt (full) *E Rec* \* Feb 7-91
- DALY College, Indore, India, Litster, abs. n *Inst C E* v 97 -89
- DREXEL office bld., Phila. *E Rec* \* May 11-89
- GAS holder tanks, Bay State Gas Co. *Am C E* \* Oct 27-92
- PARIS, consolidation of *Sc Am Sup* \* Oct 25-90
- PILE, on rock *E Rec* \* Apr 11-91; World's fair blds. *R Gaz* \* Oct 14-92
- SINKING deep, prog. in, Ormsby *E News* Feb 1; an experience in, May 31-90; *E Rec* \* Jan 18, 25: Burge *Sc Am Sup* \* Jan 25-90, prog. in, for eng. works, do. *The Eng* Dec 20-89
- SUBAQUEOUS, Shield *Eng* \* Sep 16-92; Kinipple \* Oct 10, 31, inset \* Nov 21 \* Dec 26-90, do. *E News* \* Nov 8-90, Jan 17, 24-91; concreting under water, H. White, Dec 20-90
- SUPPORTING power of soils, R. Hunt, table *E News* June 16, *E Rec* June 23, abs. *Inst C E* v 94 -88, *J Assoc E Socs* -88, *Sc Am Sup* June 30 -88
- UNDERPINNING by means of grouting and stock ramming, Kinipple *Eng* \* May 20, 27, *Sc Am Sup* \* Sep 17, 24-92; Great Yarmouth Town Hall, Duckham, inset *Inst C E* \* v 98 -89
- VAULT walls and roof proportioning *E Rec* \* June 14-90
- WORLD's Columbian exhib., Chic., Gottlieb *Eng* Dec 4; and floors *E Rec* Dec 5-91; pile *R Gaz* \* Oct 14-92
- Foundry**, work, es. cost of, Fowler, effect of adding wt. iron or steel, Morgan, discuss., best molds for steel castings, do., best pig iron for light castings, Towne, discuss. *Am M E* v 9 -88; cupola experience, Scheffler \* v 9 -88, v 10 -89
- Eng* the Stewart 'Rapid' cupola furnace \* Dec 5-90; Archdale & Co., Birm., England \* Sep 18-91; cupola fur. construct. for melting pig iron, Gouvy, Durfee *E & Min* \* Feb 16, 23 \* Mar 9, 16, 30-89; the Worthington plant, Elizabethport, N. J. (full) *E Rec* \* Apr 2-92; mechan. treatment of moulding sand, Bagshaw; insets *Inst M E* \* Jan -91; iron foundry, Master's *Sci Am* Oct 20-88; moulder's tools *Sc Am Sup* \* Mar 10; Gov't. plant for New So. Wales *The Eng* Sep 14, 21, Oct 5, 5, 12-88; railroad locomotive construct. Apr 22 \* May 6, 20-92



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**Frend**, William A. *Inst C E* v 98 -89

**Frick**, Henry C., por. *E & Min* \* Dec 19-91

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- Garbage** and town refuse disposal, Foster *Eng* \* Dec 18-91; crematories, Kilvington *E Rec* Feb 23-89. See also CREMATORIES; MUNIC. eng.
- Garland**, Thomas B. *Inst C E* v 100 -92
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- BUENOS AYRES** supply, Stevenson *Inst C E* v 103 -91
- BUOY**, steel *The Eng* Sep 13-89
- BURNERS**, effic., expts., Bouvier *Eng* Mar 15-89
- CANNEL**, ed. *The Eng* Sep 23-92
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- COMPANIES** and incand. elec. lighting, Day *El Eng* May; future prospects, T. Wood *Sc Am Sup* June 2-88
- COQUEREL** plant, Vitoux, abs. *Inst C E* v 105 -91 *Genie Civil* \* v 19 -91
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- ACME**, M'Ghee & Burt's *The Eng* \* Apr 4-90



- GAS ENGINES, AJAX** single-acting, tests, Jamieson, report *The Eng* \* Aug 9-89
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- BECK, the *Eng* \* May 4, 11, tests, Kennedy *E News* June 9, *The Eng* May 4, 11-88
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- FORWARD, the *Eng* \* Mar 8, 8, *The Eng* \* Apr 5-89 \* July 11-90 \* Aug 21-91
- GRIFFIN, the *Eng* \* Apr 13, June 1, *The Eng* May 18, 25, June 1-88
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- FUEL-gas**, notes, Goetz *Am Min* \* v 18-90; Loomis proc., Oakman *Eng* Aug 1 \* 22, do. gen. plant *E News* \* Oct 11, do., insets *Inst M E* \* July -90, and applics., do. *Sc Am Sup* \* Nov 1-90; furnace, Archer combination *E & Min* \* Mar 1, June 14-90; manuf. fuel-gas for heating, Christian, and ed. *E News* May 30, 30-91; production, Kitson's method \* May 26-92, do. *F Inst* Dec -91; impracticability of util. coal gas for fuel, Merkle *Lehigh Eng J* Apr, expts. with mixture of three gases, do. June -89; and incand. gas lighting, Lungren *Sc Am Sup* Mar 3-88, *Light, Heat and Power*



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**Gaseous** illuminants, Lewes (full) *Sc Am Sup* Mar 7-28-91, *J Soc Arts Lond.* See also FLAME; LIGHT

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**Gilbert**, William, of Colchester *Eng* Dec 20, 27-89, (full) *Sc Am Sup* Mar 29-90 *Eng*

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- Glacial**, epochs, D'Assier *Sc Am Sup* Feb 4, 11-88; geology, Geikie, Nov 30, Dec 7-89
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- Glazing**, or lustering bodies *Sc Am Sup* Apr 9-92
- Globe**, terrestrial, Paris exhib. *Sc Am Sup* \* June 22 \* Aug 10-89, *Genie Civil, La Nature*
- Gold**, *Am Min* chlorination of gold-bearing sulphides, Spilsbury, v 16 -88; chlor. of low-grade auriferous sulphides, Phillips, v 17 -89; treatment of fine gold in sands of Snake river, Idaho, Egleston \* v 18 -90, Thies proc. of treating low-grade aurif. sulphides, amalgamation at Comstock lode, Nev., hist. sketch, Hodges (full) \* v 19, 19 -91; electro-magnetic separation of *El Rev* \* Sep 28; in Nova Scotia, n *Eng* Jan 4-89
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MULATOS mines, State of Sonora, Mex., Janin *E & Min* \* Feb 1-90



**Gold MINES, PERU**, mining in, by the Incas, Olcott *E Mag* \* Apr -91

TRANSYLVANIA, mining in, Thito, abs. *Inst C E* v 99 -90, *Berg u Hut Zeit* -89

UTAH and Mont., and silver mining in, Hollister *Am Min* v 16-88

VICTORIA mining, '91, commission report, abs. *Inst C E* v 110 -92

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Gold Coast banket deposits, W. Africa, Halse *E & Min* Mar 14-91

Gooch, Daniel *The Eng* Oct 18-89

Goodyear, Charles (rubber inv.), por. *Sc Am Sup* \* Jan 31-91

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- Gramme**, Zenobe, por. *Sc Am Sup* \* May 25-89
- Grammophone**, the Berliner *El Rev* \* Dec 27-90, Jan 8-91;  
Houston *F Inst* \* Jan; etching the human voice, Berliner \*  
June, do. *Sc Am Sup* \* July 14-88; \* Sep 6-90
- Granite** indus. of U. S., Day *E & Min* Apr 25; quarrying, cut-  
ting and polishing, do. May 9; rifting, Tarr \* 23-91, *Am J Sci*;  
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- Grant**, John *Inst C E* v 92-88
- Grantham**, Richard B. *Inst C E* v 108 -92
- Graphical** dynamics, the subnormal in, Church *F Inst* \* Jan -92
- Graphics**, or the Art of Cal. by Drawing Lines, R. H. Smith, bk.,  
Longmans, Lond., '89 *The Eng* Sep 6-89
- Graphite** produc., U. S., '89, Parker, Cen. bull. *E & Min* Oct 10  
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- Graphophone**, Edmunds *Eng* Sep 28; and phonograph (full)  
*Sc Am Sup* \* Oct 27-88. See also under PHONOGRAPH
- Grates**. See FURNACES, grates
- Gravel** mining, Osceola Co. report *E & Min* \* May 30-91
- Gravitation**, theory verification, Gore *R & Eng* \* June -91,  
mystery of, do. *Littell's* Mar 12-92, *Nat Review*; constant  
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- Grease**, Yorkshire, Hurst *Sc Am Sup* May 25-89
- Great Britain**, trade, export and import, diag. *Eng* \* Mar 16; port  
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Dilke, Jan 9, imperial, ed. Mar 13; ordnance factories constitu-  
tion, Anderson, Oct 9-91; currency commissioners' arguments  
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- COLONIAL development and Brit. trade, ten years of *Eng* Mar  
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C. E., Coode, Pres. addr. *Inst C E* v 99 -90
- NAVY, naval manœuvres, ed. *Eng* Jan 6; estimates, eds. Mar 9,  
Dec 21-88, Mar 20; strength of, ed. Feb 15; coaling, Long-  
ridge, July 19; contract work, ed. Oct. 18; ed. Nov 29; naval  
mobilization, bk. review, Dec 27-89; estimates, ed. Mar 14;  
naval manœuvres, White, 28; additions in '90, Dec 19-90;  
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**Great Britain**, SHIP-building, 1889 *Eng* Dec 20, 27-**89**; shipping stats. May 30; and marine eng. in '89, Jan 3, 17, 24, in '90, Dec 26-**90**, Jan 2, Scotland \* 23; supremacy of mercantile fleet, eds. July 10, Oct 30-**91**; 1891, Jan 1-22-**92**. See also SHIP-building

**Greck**, Peter *Inst C E* v 94 -**88**

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**Greeley**, Horace, fac-simile letter *El Rev* \* Oct 18-**90**

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**Grice**, Edward *Inst C E* v 90 -**89**

**Grierson**, James (full) *Inst C E* v 99 -**90**

**Griffin**, Heneage M., por. *E & Min* \* May 30-**91**

**Grinding** machine, universal, Brown & Sharpe Manuf. Co. *E News* \* Mar 7, *R Gaz* \* Feb 27; machinery, Ball mill plant *The Eng* \* Mar 13-**91**. See also DISINTEGRATORS; EMERY wheels; MILLS

**Grist mills** *Eng* \* June 27, and disintegrator trials, Roy. Agric. Soc. *The Eng* \* June 27-**90**

**Grundtvig**, Conrad H. W. *Inst C E* v 103 -**91**

**Gruson**, Hermann, por. *Sc Am Sup* \* Aug 10-**89**

**Gum arabic and mod. substitutes**, Rideal (full) *Sc Am Sup* Sep 19, 26-**91**, *J Chem Indus*

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*E News* cellulose ar. Dec 1-**88**; steel, Annapolis tests, Sep 20, 27 \* Oct 4-**90**; Justin projectile expts. \* Aug 4-**92**; Gov't. ar. tests, Indian Head, Md. \* Nov 28, do., ed. *Eng* Nov 27, do. *The Eng* Nov 20, Dec 11-**91**; development of Am. ar. plate, Garrison, insets (full) *F Inst* \* May - July -**92**; ar. plate perforation expts., Labouret, abs. *Inst C E* v 102 -**90**; forged steel projectiles, manuf., Carnegie, abs. v 110 -**92**; ar. development, Califf (full) *R & Eng* \* Nov -**89** - Nov -**90**, expts. \* July, Aug -**91**, Am. trial, do. \* Jan -**92**; Annapolis test *R Gaz* Sep 26-**90**

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\* Oct 18; armament, new features (high angle fire) \* Nov 22-90; mod. ar., Brainard \* May 23-91

*The Eng* penetration of ar. plates, cal. of trajectories, May 11, 11; Krupp's projectiles and Brit. steel-faced plates, July 13; French and Ital. ar. tests, Nov 16; Gruson's armored carriages, Schumann, Dec 7, 7; ar. lead tempering, Lisbonne, June 1-88, *Genie Civil*

*The Eng*, the Graydon shell \* Feb 22; ar. for ships, Barnaby \* Apr 12; compound ar. and steel, Schneider, July 12, 12; Dutch ar. trials \* Nov 22-89; artillery expts. at Buckau \* Sep 26 \* Oct 3; steel-faced ar., St. Petersburg trial \* Nov 21-90

*The Eng* Russian ar. trials \* Jan 9; deck ar., for vertical fire, expts., Japan \* June 5; Bethlehem steel ar., after test \* Aug 28; Royal ordnance factories, constitution of, Great Brit. Oct 9; ar. trials at Shoeburyness \* Nov 6, at Portsmouth, England \* Nov 13-91

*The Eng* Harvey nickel ar. trial \* Aug 19; ar., recent prog. \* Sep 16; Vickers Harvey ar. \* Dec 16; German and French imitation cupolas and shields \* 23-92; gunnery questions, how settled by cal. July 27, Sep 28, Dec 21-88, Jan 11, Aug 16, 23-89, Feb 14 \* Mar 14-90

RANGE finder, Fiske's elec. *E News* \* Jan 31-91, position indicator *El Wld*, *Sc Am Sup* \* Apr 19-90 \* Feb 7-91, *El Eng*, *The Eng* \* Dec 26; underground range, Kennington \* Apr 18-90. See also INSTRUMENTS, range finder; PROJECTILES

**Guns**, development of aut. fire-arms *Eng* Jan 27, Feb 3; steel for heavy, ed. Mar 23, May 25, Cubillo \* 25, cast steel, ed. Dec. 21-88; cor. Mar 1; and gun-powder, Longridge, Oct 25-89; aluminum-bronze for, Dogger, Sep 12-90; development of field artillery, Walford, Mar 6-91; U. S. mod. artillery \* Oct 21, 28 \* Nov 4-92

*E News* making of great guns, ed. Nov 16-89; new cannon for U. S., n Jan 31-91; Paris exhib., metallurgical arts, Garri-son *F Inst* \* July \* Aug -90; use of liners in ordnance, Long-ridge *Inst C E* v 109 -92; steel, Chernoff, inset *Inst M E* \* July -91; 111-ton English *R & Eng* \* Mar -88; 110-ton \* Sep -91, do., firing of *Sc Am Sup* \* July 18-91; the gun \* Oct 5, 12-89, *Genie Civil*; Brit. and foreign *The Eng* June 1; of the Benbow, Jan 13; the supply of 1886-7, June 8; siege artillery, English and Russian, Nov 30-88; Internal Ballis-



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- tics, Longridge, bk., Spon, Lond. '89, Sep 18-**89**; at Naval exhib., Lond. \* May 29; erosion in large, Maxim \* Sep 11-**91**
- ARMSTRONG rapid fire *R & Eng* \* July -**91**, *Industries*; 110½-ton, for str. Victoria *The Eng* \* Mar 28, str. Teutonic \* Dec 19-**90**
- BREECH-loading, mechanism for 10-in. *Eng* \* June 10-**92**; 12-in army rifled *R & Eng* \* Sep -**91**, *Iron Age*
- BOFORS cast steel, Michaelis *Am Min* v 16 -**88**, *Sc Am Sup* Sep 15-**88**
- BROWN segmental wire-wound *E News* \* Nov 24-**92**, *Sc Am Sup* \* Jan 11-**90**, Wittman \* Dec 24, *The Eng* \* Nov 11-**92**, *Am Min*
- CANET quick firing, with elec. training gear *El Rev* \* Sep 27-**90**; 66-ton, test *Eng* Feb 27, Sep 4; vs. Krupp, Dec 25-**91**, Jan 1, 15-29, Feb 5, Apr 1, May 20, June 3, 10-**92**; large, for Japan *E News* \* Jan 30; and ar. trials *Sc Am Sup* \* Jan 16, 16-**92**; *The Eng* \* June 12 \* Dec 11-**91**
- CANNON, mod. high power rifled, development, Califf (full) *R & Eng* \* Jan \* Feb, Apr — \* Oct -**89**
- COLT's navy revolver, com. report *F Inst* \* May -**90**
- DRIGGS-Schroeder quick firing *Eng* \* Oct 28-**92**
- DYNAMITE, development, Batcheller *E Mag* \* Sep -**91**; 15-in., trial *Sci Am* Feb 18-**89**; Zalinski pneu. *Sc Am Sup* \* May 12; pneu., Haig \* Mar 10, do. *The Eng* Feb 3, Zalinski, 17-**88**; U. S. navy report, Mar 29-**89**; the Graydon \* Jan 30-**91**; pneu. sea-coast (full) \* June 10, 10-**92**
- ELSWICK *Eng* \* Oct 25 \* Nov 1, 15-29-**89**, Naval exhib. \* July 17, gallery, do. *The Eng* \* May 1-**91**; 6-in. disappearing carriage \* Mar 11-**92**
- FACTORIES, of Forges and Chantiers, Havre (full) *Sc Am Sup* \* June 21-**90**; Royal ordnance, constitution of, Great Britain, Anderson *The Eng* Oct 9-**91**
- FIELD, and mountain, Armstrong *Eng* \* Dec 6-**89**; Russian field and coast *Sc Am Sup* \* Sep 1-**88**, *The Eng*
- FRENCH artillery, insets (full) *Eng* \* Jan 3-**90** — Apr 24-**91**; quick firing, ed. Aug 12-**92**; mod. *Sc Am Sup* \* July 19-**90**
- GERMAN magazine rifle *Eng* \* May 15, new *Sc Am Sup* \* Jan 3-**91**
- GIFFORD liquid-gas *E News* \* Aug 9, carb. acid *Sc Am Sup* \* Aug 30-**90**
- GRUSON's quick fire *R & Eng* \* Apr, *The Eng* \* Jan 10-**90**



- GUNS**, HOTCHKISS ordnance *Sc Am Sup* \* July 13-89, revolving cannon \* Mar 7-91, *Eng*; Paris exhib. *The Eng* \* June 7-89
- HOWITZER, 11-in., Armstrong *Eng* \* Jan 6-88; cast iron, Spain \* Mar 11-92; high angle battery *The Eng* \* July 18-90
- KRAG-Jorgensen repeating rifle *E News* \* Oct 6, *R & Eng* \* Oct -92
- LEBEL magazine rifle *Sci Am* Oct 27, *The Eng* Sep 28, 28-88
- LONGRIDGE, the *Eng* \* May 4, 11, *The Eng* May 11-88
- MACHINE, Miller's aut. indicator for *Sci Am* Mar 9-89
- MAGAZINE rifles, rifle-mark, ed. *Eng* \* Feb 6; the Mannlicher (our new) \* Mar 6; the Mauser \* Apr 3; Swiss \* Oct 2; Rees' \* Nov 27-91; new *Sc Am Sup* Apr 5-90; mag. guns development, A. Russell \* *Soc Arts Mass* -90; *The Eng* \* Apr 4-90; new \* Feb 6; small arms, tests, N. Y. \* Sep 4-91
- MAXIM aut. machine, inset *Eng* \* Jan 27; 3-pounder \* June 22-88; \* Oct 9, 16-91; *Sci Am* Feb 16-89; *Sc Am Sup* \* July 7, *The Eng* June 1-88
- MORTARS, U. S. cast iron coast *Eng* \* Mar 18, 25 \* Apr 1-22, do. 12-in. breach-loading rifled *E News* \* Dec 8, *R & Eng* \* Dec -92; 12-in. manuf., Fuller, Connet *Sc Am Sup* \* Sep 6-90 \* Jan 17-91, *Steven's Indic*; 12-in. rifled, S. Mansfield *Soc Arts Mass* -91; mod. breech-loading rifled construct., A. Russell *Tech Q* \* Apr -92; Whitworth mounting for high angle fire *The Eng* \* July 24-91; U. S. breech-loading \* Dec 9-92
- MOUNTINGS, strs. Devastation and Rupert *The Eng* \* Apr 24 -91
- NORDENFELT, disappearing turrets for *Eng* \* Oct 30-91; light quick fire batteries *The Eng* Jan 20, Feb 24-88
- PNEU., torpedo, Zalinski *Eng* July 12-89, do. *R & Eng* \* May -88; *Sc Am Sup* \* Oct 12; the Dudley *The Eng* Sep 6-89
- QUICK firing, rapid firing, Kimball *Eng* Jan 13, Feb 10, 24, Aug Aug 24-88; ed. Sep 30, Oct 7-92. See also GUNS, Drigg's—Gruson — Nordenfelt — Schneider, etc.
- RIFLES of mod. armies *R & Eng* Jan -88; military rifle development, Califf \* Jan \* Feb -89, do., reduction of calibre in, Dunn *Sc Am Sup* Dec 22-88
- RUSSIAN artillery in 1888 *The Eng* July 27-88
- SANS-PAREIL, the *The Eng* \* Feb 6-91
- SCHNEIDER quick-firing *Eng* \* Sep 16-92
- SMALL arms manuf., Rigby *Eng* Dec 2, *Inst C E*, *The Eng* Dec 2-92; magazine, tests, N. Y. \* Sep 4-91



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**Guns, STEADY** platform, Tower's *Eng* \* Apr 26-89

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THURLOW cast-steel *E News* Feb 16-89

U. S. mod. artillery *Eng* \* Apr 29 - Sep 23, table (full) 30 \* Oct 7, 21, 28 \* Nov 4-92; new cannon for, n *E News* Jan 31; ordinance, notes, table *R & Eng* Aug -91, *Ar & Navy J.* See also GUNS, mortars, U. S.

**Gutta-percha** *El Rev Lond* Nov 21, Dec 5-26-90, Jan 2, expts. Mar 6, supply, n Oct 23-91, do., Serullas, May 20-92, future supply, do. *Sc Am Sup* Nov 5-92

**Gymnastics**, exercises and ap. *Sc Am Sup* \* Mar 16-30 \* Apr 6-89; \* June 7-90

**Gyroscopes**, Jansen, cor. *The Eng* \* Sep 30-92

**Hack**, Thomas *Inst C E* v 93 -88

**Hackney**, William *Inst C E* v 100 -90

**Haghe**, Augustus *Inst C E* v 101 -90

**Hall**, Richard T. *Inst C E* v 99 -90

**Hall**, William J. *Inst C E* v 102 -90

**Hallauer**, Octave-René, Hirn *The Eng* June 13-90

**Hamand**, Arthur S. *Inst C E* v 97 -89

**Hamill**, Edward D. *Inst C E* v 100 -92

**Hamilton**, George A., por. *El Wld* \* May 11-89

**Hammers**, Thwaite's suspen. pneu. power *Eng* \* Mar 13-91; aut., the MacCoy pneu. tool *E News* \* July 27-89; and rams, Jameson *R & Eng* Oct -89; the Longworth power \* Aug -92, *The Eng*; pneu. *Sc Am Sup* \* Apr 25-91; blows, force of, *The Eng* Aug 30-89. See also STREAM hammers

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**Hancox**, Joseph *Inst C E* v 99 -90

**Hand-writing**, elec. transmitting, Gump \* *Soc Arts Mass* -89

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**Harbor engineering** *Eng* harbors, natural and artificial, Cheeswright, Mar 20; concrete in har. works, Apr 17-91 \* Aug 26 \* Oct 7-92

*E News* physical phenom. of entrances, Haupt \* Feb 25-88; excav. under water, cost, table, U. S. Eng'r. Dept., Jan 5; submarine excav. in sand, Ter-Meulen excavator \* Mar 23-89; double sextant for hydrographic surveys \* June 28; subaqueous foundations, Kinipple \* Dec 13, 27-90; shore protection \* Feb 6-92



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*E Rec* subaqueous foundations, grouting below water, Kinipple, Feb 21; coffer dam or caisson without timber or iron, Harris, Mar 7; natural and artif., Cheesewright (full) \* Apr 18-91, do. *Sc Am Sup* \* May 30 \* June 6-91; use of beton in construct. of ports, Kinipple \* Nov 24-88; Am. eng., Wisner, Aug 15; Lobnitz system of rock removal under water without explosives \* Oct 3-91; submarine excavs. in sand \* May 18-89, *Genie Civil*. See also CANALS; DAMS; DOCKS; DREDGING; FIRE IS; FLOOD gates; FOUNDATIONS; LANDING stage; LIGHT-houses; MARINE signals, types; PIERS; PILES; RESERVOIRS; RIVERS imp., etc.

ANTWERP port works, Matthys abs. *Inst C E* v 101 -90

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BARS, in tidal estuaries, Wheeler *Eng* Feb 7-90; imp., Haupt *F Inst* July, D'Auria, Sep, discuss., Haupt, Oct -89

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BEACON lights and fog signals, Douglass *The Eng* \* Mar 29-89

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BORDEAUX port *Eng* \* Dec 13-89

BRAZOS river imp. and, Craighill, Corthell, discuss. *Am C E* v 26 -92

BREAKWATERS, concrete, Del. bay *E News* \* Jan 31; do., Schermerhorn report (full) *E Rec* \* May 16-91; and force of impact of waves, d'Auria *F Inst* Nov -90, Jan -91

BREMEN works, abs. *Inst C E* v 96 -89, *Zeit deut Ing* -89

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CALAIS works, France *Eng* \* May 17, inset, 24, 31-89; quay foundations, Betillart report *E News* \* Jan 4-90; Richou, abs. *Inst C E* v 101 -90 \* *Genie Civil* v 15-89; inset *Inst M E* \* July -89

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CHARLESTON imp., Wisner *R Gaz* Sep 30-90

CHICAGO as a sea-port, maps *Eng* \* Feb 20, do. *Sc Am Sup* \* Mar 28-91; ed. *R Gaz* July 15-92

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**Harbor**, DEFENCE, elec., Sims-Edison torpedo *El Wld* \* Apr 25 -91

DELAWARE breakwater imp. *E News* \* Feb 6-92

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DUBLIN port, Griffith, insets *Inst M E* \* July -88

DYKES, brush, spec. for, Craighill *E News*, Oct 19-89. See also DIKES; HOLLAND, do; RESERVOIRS; RIVERS, imp.

ENGLISH, new schemes *Eng* Jan 23-91; Brit., and water-ways *The Eng* Aug 5-92. See also HAR., Goole

GALVESTON, Tex., entrance imp., Wisner, cor. *E News* Dec 6-90; prob., Haupt *F Inst* Oct -91

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HAMBURG, Alster lock widening, Roeper *Inst C E* v 107 -92 \* *Deut Bauz* -91

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LAKE Ontario natural harbors *E News* \* Mar 8-90

LA ROCHELLE works, Italy, com. report, abs. *Inst C E* v 95-89, *Giorn Genio Civil* June -88

LIMERICK dock walls, failure and construct., Hall *E Rec* \* Mar 28-91, *Inst C E*

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- Harbor, MONTREAL** imps. *E News* \* May 2-91; old revetment wall, Sproule *R & Eng* \* Dec, *R Gaz* \* Nov 18-92
- NANTES port of *Eng* \* July 19, 28-89
- NAPLES works, Gatto, abs. *Inst C E* v 102 -90, *L'Ingeg Civile* -90
- NEW York, bulk-head construct. *E News* \* May 25-89; imp. of entrance, Edwards, dredging ap., inset \* Mar 19; masonry sea-wall, light-house station \* Dec 15-92; removal of obstructions, Hell-gate, abs. *Inst C E* v 93 -88, \* Report Ch. of Eng'rs. U. S. Army -86; imp. *Sc Am Sup* \* Aug 25-88
- OTAGO imp. Barr *Inst C E* v 110 -92
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- PHILADELPHIA port of, Haupt *F Inst* Jan, Mahan, Mar, Apr -92
- POINT Judith harbor of refuge, R. I. *E News* \* Apr 18-91
- POOLE improvement *The Eng* May 8-91
- PORTSMOUTH, tides near, Townshend, inset, abs. *Inst C E* \* v 97 -89; dockyard, C. Robinson *Sc Am Sup* \* Dec 3-92
- PRESTON docks *The Eng* Mar 23-88
- RICHMOND, Va., eng. prob. at, Adams *Am M E* \* v 12-91
- ROCHELLE, compressed air pier foundations, Thurninger, La Pallice har., abs. *Inst C E* v 100 -90, *An Ponts* \* Nov -89
- ROUEN port of *Eng* \* Oct 11-89
- SABINE Pass imp., Turtle, cor. *F Inst* Sep -88
- St. John, N. B., imp. and docks *E News* Apr 7-88
- St. Nazaire, France, lowering masonry shafts for quays, Mahan *E News* \* Oct 27-88
- SALTBURN-by-Sea, works near *Eng* \* Mar 14-90
- SAN Francisco, water-front structures, Manson *E News* \* Dec 29-88; caisson used in founding sea-wall, R. Hunt \* Aug 2-90
- SCOTLAND. N. and West coast piers and, Barron, inset *Inst C E* \* v 99 -90
- SEA-walls, use of asphaltum in, Ambrose, and discuss. *Am C E* v 24 -91, do. *E Rec* May 16-91; caisson used in founding, San Francisco, R. Hunt *E News* \* Aug 2-90; masonry, light-house station, N. Y. \* Dec 15-92; sinking foundation of by water-jet *E Rec* \* Mar 14-91; Scarborough, No. Cliff, and Royal Albert drive securing, Aytoun, insets *Inst C E* \* v 105 -91
- SWANSEA port and dredging entrance channel, Capper *Inst C E* v 103 -91



**Harbor**, TEXAS deep-water port, need of the So. West, Haupt *R Gaz* Aug 10, *Sc Am Sup* Oct 6-88

TORONTO esplanade question *E News* \* Jan 4, 11-90

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**Launching**, ship, statics of, Baxter, abs. *Inst C E* v 110-92, *U. S. Naval Inst* v 18-92. See also SHIPS

**Law**, legal decisions, notes *E News* Oct 11-25, Dec 13, 20-90; public rights in private property, Fisher *St R J* May -92; evidence, accuracy, see OBSERVATION, average. See also ELEC Co.'s., Edison — lamp, incand. pats. decisions; MINING; PHOTOGRAPHY, the law and; PRICE regulating; SURVEYING

**Lead**, produc. and trade, '87 *E & Min* Jan 7-88, Jan 12-89; and copper cupolas, temp. in, and aluminate slags, Henrich, Dec 27-90; in '89, Jan 4-90, in, 90, Jan 3; and zinc mining, U. S., Kirchhoff July 11-91; U. S. produc. '91, Jan 2; blast fur., cal. of charge, Hofman, bk. (full) Sep 3, 17-92

BONNE Terre, Mo., St. Joseph Co. dressing works, Munroe, insets (full) *Am Min* \* v 17-89, (full) *E & Min* \* June 22, 29-89

SMEETING, cast-steel water-jackets, note on, Terhune *Am Min* v 17-89; Lewis & Bart. bag proc. of collecting lead fumes at Lone Elm works, Joplin, Mo., Dewey (full) \* v 18-90, do. abs. *Inst C E* v 102-90; roasting vs. fusing, Newhouse *E & Min* Feb 28-91; slag pots, Hofman \* Dec 31-92

**Leadville**, Col., geol. and mining indus., U. S. Geol. Survey monograph 12, Emmons, bk. review *E & Min* Apr 7, May 12-88

**Leather**, from tannery to dynamo, Schieren *El Eng* \* Mar 2, *St R J* Mar, *Sc Am Sup* Mar 19; elec. tanning, Worms & Bales' rapid proc. \* July 9-92, *Genie Civil*; leather-making (Am. Indus. development), Rich *Pop Sci* \* July -92. See also BELTS

**Leather**, Samuel P. *Inst C E* v 98-89

**Ledger**, James C. *Inst C E* v 100-90

**Lee**, Henry *Inst C E* v 97-89

**Lee-Smith**, Hamilton *Inst C E* v 99-90

**Le Mesurier**, Henry P. (full) *Inst C E* v 98-89

**Length**, standards of, Bond *Soc Arts Mass* -88. See also WEIGHTS and measures

**Leslie**, Frederick *Inst C E* v 98-89



- Leslie, Henry H.** *Inst C E* v 98 -89
- Leslie, James (full)** *Inst C E* v 100 -90
- Leveson-Gower, Granville G.** *Inst C E* v 104 -91
- Lewis, H. C.** *F Inst* Aug -88
- Lewisohn, Leonard**, por. *E & Min* \* Oct 3-91
- Library**, indicator for books, n *E News* Jan 24-91; Nat., at Wash. *Sc Am Sup* Dec 31, of the U. S. (Libr'y of Congress), Spofford *Forum* Nov -92. See also BUILDINGS, library
- Lid**, annular, strains on resisting internal pressure, Rutherford *Am M E* \* v 10 -89
- Life-boats**, Henderson's collapsible *Eng* \* Apr 12-89; models, expts., Corbett \* Apr 25-90; steam, Jan 23-91, do. 'Duke of Northumberland' *E News* \* Sep 27, do. *The Eng* \* Sep 5, 12, do. hydr. jet-propelled *Sc Am Sup* \* Oct 4-90; collapsible \* Aug 10-89; models, expts., Corbett (full) \* June 7-90. See also LIFE-saving
- Life-buoy**, the Franklin *Eng* \* Nov 20-91
- Life insurance**, life-expectancy rule *Locom* July -86; the expense margin in, Wills *Sc Am Sup* Jan 31-91
- Life-saving**, and salvage str. Aid, inset *Eng* Mar 4; U. S. Service, Piper *F Inst* Jan; devices, Woolven *Sc Am Sup* \* Apr 2, 16-30 \* May 14 \* July 2, 9, 23 \* Aug 20, 27 \* Sep 10 \* Oct 1, appliances \* Dec 10-92. See also LIFE boats—buoys; U. S. Life Saving Service
- Lifts**. See ELEVATORS; HYDRAULIC lifts
- Light**, photometry, personal error in, Nichols *El Eng* \* July -89, new photometer, do. \* May 28, do. *El Rev Lond* July 4-90; photometric research, R. C. Richards \* Mar 27 \* Apr 3 \* Sep 4 -25, Oct 2, 9, 16-91
- El Rev* and color, Spice, Mar 30; and electricity, identity of, Herz, Dec 14-89; new photom. notes, Nichols, May 31; units of light and brightness, Weber, Sep 6; Varley's photom. \* Oct 18; artificial, of future, Nichols (full) \* Nov 29-90
- El Wild* photometry, personal error in, Nichols \* June 1-89; new photom., do. \* May 31; the Bolometric spectrometer \* June 21; artif., of future, Nichols (full) \* Nov 29, discuss. Dec 6-90; photometers \* Apr 25-91; Hering's portable photom. for st. lights and illum. \* Jan 16-92
- Eng* refraction goniometer, Trotter \* May 17-89; illum., distrib. and measurement of, do. *E News* \* Nov 24, do. and discuss. (full) *Inst C E* \* v 110-92; the ether-oxygen lime light,



## 208 LIGHT, LIGHT-HOUSES - ST. CATHERINE'S

### Light

Ives *F Inst* \* Jan -88; mod. conception of (full) *Locom* Nov -90

*Sc Am Sup* and color, Abney (full) \* Mar 2-23; optical torque, S. P. Thompson (full) \* Aug 10 \* Sep 21; mod. theory, Lodge, 28; effect on matter, Abney, Oct 5-89; the spectrum and its development, Yeo (full) \* Feb 1, 8; radiophony, Bell, May 10; artif., of the future, Nichols (full) Dec 13-90; optical projection *The Eng* \* Apr 22-92. See also COLOR; ELEC. light; GASEOUS illuminants; LIGHTING

**Light-houses**, Sautter, Lemonnier & Co's exhibit, Paris *Eng* July 19-89; illuminants, ed. Oct 31; stability, E. Schmitt, cor. *E News* \* Dec 6-90; fog or dipping ap. for elec. light in, Stevenson, inset *Inst C E* \* v 92 -88; French, n *R & Eng* \* Apr -90, *Genie Civil*; oils, Edwards (full) *Sc Am Sup* Mar 19; lens (large), Wigham, June 11, do. *The Eng* Apr 22-92; elec., Scand. exhib., Copenhagen, Nov 9-88; Douglass \* Mar 29-89. See also WAVE pressure on structures

BISHOP'S Rock and Tory Is. *Eng* Feb 26, Douglass, illum. by gas, Salmond, discuss., insets *Inst C E* \* v 108 -92

BULL Rock, So. Coast Ire. *Sc Am Sup* \* Oct 5 *The Eng* Aug 23 -89

CAMPEN and illum. of Lower Ems, Riensberg, abs. *Inst C E* v 103 -91, *Zeit deut Ing* -90

DIAMOND Shoal, Outer, Cape Hatteras, N. C., proposed *E News* Oct 5-89, inset \* July 26, 26, Aug 2, inset \* 9, *R Gaz* May 30 -90

EDDYSTONE model, Naval exhib., Lond *The Eng* \* Apr 10 -91

FINLAND, recent, Strukel, abs. *Inst C E* v 110 -92, *All Baus* -92

GIBB'S Hill cast iron tower, Bermuda *R & Eng* \* Feb -89

HATTERAS light contract, ed. *E News* May 31-90. See also LIGHT-house, Diamond

MEW Is., Dublin, Griffith, insets *Inst M E* \* July -88

OLD Orchard Shoal, N. Y. harbor *E News* \* Feb 6, *R & Eng* \* Mar -92

OYSTER Is., Burmah *The Eng* Sep 13-27-89

St. Catherine's Point, Isle of Wight, most powerful light in world, Douglass *Sc Am Sup* \* July 21 *The Eng* June 15 -88



**Lighting**, artif. illum., effic. of methods, Nichols (full) *El Rev Lond* \* Apr 12, 19, do. (full) *El Wild* \* Mar 30, do. abs *Inst C E* v 97-89, do. (full) *El Eng* \* Apr-89; artif. of future, do. (full) \* Nov 26-90; elec., relation to optical science, Boyle (full) *El Wild* \* Nov 14-91; compressed oil-gas, Ayres *Eng* Apr 13-88; the Wells system *E News* \* Aug 10-89; illum. and ventil., Lewis *E Rec* Jan 11-90; Welsbach system, Granger *F Inst* \* May-88; developments in artif. illum., Morton *Sc Am Sup* Mar 16-89; by compressed oil-gas \* July 26-90; Harcourt's Pentane standard lamp, Clifford *Tech Q* May-90. See also ELEC. lighting; GAS-lighting; LIGHT

**Lights**, st. and illum., Hering's portable photom. for *El Wild* \* Jan 16-92; contractor's portable *E News* \* Nov 16-89; the ether-oxygen lime light, Ives *F Inst* \* Jan; the Lucigen, econom. illum. from waste oils, Hannay *Sc Am Sup* \* Jan 14; floating, 8-ft. cyl. lanterns *The Eng* Nov 9-88. See also ELEC. lighting and lights

**Light-ship** No. 5, with elec. lights, U. S. *R & Eng* \* Aug, abs. *Inst C E* v 106-91

**Lightning** *El Eng* Varley Sep-Dec-88; arresters and photog. study of self-induction, Acheson (full) \* Feb; conductors and arresters, Brit. Assoc. discuss. Apr, May-89; arrester, Westinghouse \* Apr 9; the Wirt arrester \* May 7; conductors, Lodge, July 2-90; protection, Hodges \* Feb 11, Hubbell, June 17-91; arresters and discuss. of non-arcing metals, Wurtz (full) \* Mar 23-92  
*El Rev Lond* Varley, July 20 - Oct 12, Nov 2, rotary motion, Parker, Dec 14-88; arresters and self-induction, Acheson \* Feb 1, 15; Lodge (full) May 3-24 \* June 6-20; conductors, Varley, July 5 \* 19, Aug 9, Oct 4, 18-89; connection, Fischer, Jan 24, 31, Feb 7; Mar 14-28; Apr 4, 11; conductors, Varley, May 24, 31, June 7-21; thunderstorms, Hazen, Aug 15; protection of buildings, Bennett, Oct 10-90; damage, curious case, Hands, Jan 8, protection, do. Feb 19-92

*El Rev* peculiar motions of, Parker \* Nov 24-88; arresters and self-induc., Acheson (full) \* Jan 19-89; arresters and discov. of non-arcing metals, Wurtz \* Mar 26; rods, McAdie, Sep 17-92

*El Wild* protection of elec. light stations, Jenks (full) \* Aug 18; rotary motions in, Parker, Nov 24-88; arresters and self-induc., Acheson (full) \* Jan 19, Brown, Child \* Feb 23-89; Lodge's protectors (wires) \* May 17; and the elec. spark, Bid-



**Lightning**

well \* July 19-90; rods, E. Thomson, June 27-91; caprices, Hering \* Jan 16; arresters and discov. of non-arcing metals, Wurtz (full) \* Mar 26 \* Apr 2, 9-92

*Eng* protection from, ed. Aug 3 \* Sep 7; conductors, Brit. Assoc. pro. Oct 19, 26; flashes \* Dec 21-88; rods, E. Thomson *E Rec* July 11-91; Jove's autograph, Jennings, insets *F Inst* \* Jan -92; conductors, Kohlrausch, abs. *Inst C E* v 93 -88; do., connecting with water and gas pipes, Weber, abs. v 95 -89; conductors, Frisch report *Sc Am Sup* Jan 26; discharge, influence of gas and water pipes, Wilde, Aug 3-89; protection of chimney shafts, Molyneux, Wood, Apr 19-90; rod protection, Hodges, Apr 18-91; peculiar rotary motion of and elec. curs., Parker \* *Soc Arts Mass* -89

**Limberg**, Charles T., por. *E & Min* \* Apr 25-91

**Limestone** industry, Day *Sc Am Sup* July 25-91

**Lime** sulphite fibre manuf. in U. S., Michaelis and discuss., chem. of the processes, Griffin *Am C E* \* v 20 -89, do. (full) *Sc Am Sup* Jan 11-25-90

**Lindley**, Robert C. *Inst C E* v 92 -88

**Linnæus**, por. *Sc Am Sup* \* Feb 18-88

**Liquids**, self-acting, measuring ap., Monte-jus *Eng* \* Dec 12-90; compressed, dilatation of, Amagat *F Inst* Sep -89; heating and concentrating by steam, Hudson *The Eng* Apr 11, 18 \* May 23 \* June 6, 18-90

**Liquors**, aging, Turner's ap., Ramsay's proc., Stauffer *Sc Am Sup* \* Sep 10; and preserves manuf., Brevans \* Nov 19, 26 \* Dec 3-31-92, etc.

**Liverpool**, works at *Inst M E* July -91. See also under Docks - WATER-works, etc.

**Locomotives**, Catechism of the Locomotive, Forney, bk. (very full) *R & Eng* \* Jan -88 - Oct -89; effic. of, Dixon *Am M E* \* v 11 -90; econ. of the, Bell *El Wld* May 24-90; practice, ed. *Eng* June 29-88; express pass., Paris exhib., inset \* July 5, do. ed. 26, Aug 2, 9; Brit., cost of working, table, Nov 8-89; tank express double bogie, Brunner, cor. \* Sep 26-90

*E News* oscillations registering ap. Feb 8; frt., for So. Am. (meter gauge) \* May 17; effic. of, Dixon, Aug 16-90; of world, n Oct 20-92; vibratory movements of and on timing trains and testing R. tracks, Milne, discuss., insets *Inst C E* \* v 103 -91; speed and power, Hill \* v 109-92; shipping at high



**Locomotives**

speed *Locom* July, *R Gaz*; of future, n *R & Eng* Feb -88; problem, Apr \* July -92

*R Gaz* marine practice and locom. construct., ed. June 15; road foreman (duties), Oct 12; cost of rebuilding, 19-88; proportions, cor. (full) Apr 26; Paris exhib. \* July 19, Aug 16; coal consumption as affected by enginemen, Baker, Aug 2, 30; R. I. works and Schenectady heavy express \* Oct 25-89; effic., Dixon and ed. May 23, 23, ed., June 13: minimum curvature, ed. \* Oct 3-90; free steaming, essential qualities, Mitchell, Jan 23; wheel wts. of heavy, Kruttschmitt \* May 22-91; power, suburban pass. trains \* June 10-92; waters for, Gibbs *Steven's Indic* July 15 -88

*The Eng* cost of parts in U. S. Jan 13; single vs. coupled, Apr 13; express, designs, cor., Nov 23; engine resistance, ed., Nov 16, 16, Dec 7-88, *E News*; repairing, Barker *The Eng* Feb 21; speed, ed. May 30; how propelled, cor. \* Oct 31-90; mod. construct. \* Jan 1, 8 \* Feb 5, Apr 22 \* May 6, 20 \* July 8, (brass foundry) Oct 21 \* Nov 4 \* Dec 30-92

ABT, Manitou & Pike's Peak R. *R Gaz* \* Feb 6-91

AIR-pump governor, Barnes', Wabash R. *The Eng* Oct 19-88

AMERICAN, in New So. Wales *E News* July 21, Aug 18 \* Sep 22; and English, wts. comparison, Purdon, Oct 20; exhib., Dec 22-92, *Industries*; and English, speeds *Locom* July -89; and English, eds. *R & Eng* July - Dec -90, eds., May, Aug, Nov, Dec -91, Jan, tables (full) Feb, (full) June, Aug -92

*R Gaz* in New So. Wales, cor. June 1-88; and English, ed. Apr 25, (full) May 9-90, Dean, July 10, relative merits, Forney (full) Nov 27-91, *R & Eng*, (proportions), table, ed. *R Gaz* May 6-92; practice in Am. *Sc Am Sup* \* Nov 23-89

*The Eng* Am. practice \* May 3 \* June 21, July 19, 26, Sep 6-89 \* Jan 3, 31 \* Feb 28 \* June 6 \* Oct 17, and English, ed. Nov 7-90, trials, ed. Feb 27, vs. English, Dean, and ed. July 24, 24-91, Feb 26, Mar 4, 11, exhib. of, Apr 1, May 27-92  
AM. Master Mechanics' Assoc. reports *R & Eng* July -90, pro. (full) *R Gaz* June 19, 26-91, *The Eng* July 12-89. See also RAILROADS, Master Mechanics

BALDWIN, works erecting shop *R & Eng* \* Dec -90; No. 10,000 *R Gaz* \* Sep 27-89; Erie, 10-wheel express, inset \* June 13-90; varieties built, June 5-91; in New So. Wales (full) July 15, Aug 19, *The Eng* July 1, Sep 23-92



**Locomotives**, BALT. & Ohio, consol. *R Gaz* \* Aug 2, 80; pass.

\* Sep 6-89; 10-wheel, tests, ed. (full) \* Nov 27, 27 \* Dec 11-91; 6-wheel switcher, inset \* July 22-92

BELGIAN, State R's, express pass., Paris exhib. *Eng* July 5, 5, *The Eng* \* May 3, 31, 31-89; goods, Paris exhib. \* Jan 24-90

BELL-ringer, steam *R Gaz* \* Mar 8-89; White's pneu. \* Aug 8-90

BENGAL & No. W. R., India, and rolling stock, Rhind, insets *Inst CE* \* v 91 -88

BLAST, pipe, influence of intermediate tuyeres, Fliegner, abs. *Inst CE* v 91 -88, *Schweis Bauz* Nov 5-87; nozzle, Adams' variable *R & Eng* \* Oct -90, *Eng*; pipes, Kordina's vortex *The Eng* Jan 20-88

BOILERS, strains in, Randolph *Am ME* v 9 -88; imps. in construct., Hickey *E News* \* Apr 4-91; construct. and effic., Sheffield *Inst CE* \* v 109 -92; *Locom* Nov -88; ed. *R & Eng* Oct -88; without stay-bolts, Bork \* May; expts. with, rate of combust., B. & O., temp. in smoke-boxes, Wells, ed. \* Aug -90

*R Gaz* water circulation, Hackney, Dec 28-88; grate areas proportions, ed. Apr 5; tubes length, ed. Nov 15; tube and rivet table, for spacing, Dec 27-89; C. B. & Q. experimental \* Jan 3; Leach, N. E. R. Club discuss. Apr 11; expts. with tubes of varying length, Paris, Lyons & Med. \* July 4-90

*R Gaz* stay-bolts, N. E. R. Club discuss. Mar 20; construct. imps., Hickey \* Apr 3; incrustation, treatment of waters used, Barr, Nov 13, discuss. Dec 4-91; stay-bolts in, Cole \* Jan 8; steel plates specs., Eastern R. of France, Feb 19; Phil. & Reading express, inset \* Mar 18; care of, in Algeria, Bates \* July 22 \* Aug 19; scale and feed water purification, Sep 30-92; Dean *Sc Am Sup* Feb 20-92, *Nat Car and Lo Bldr*

*The Eng* Leach's flexible stays, Feb 10-88; steel, Lond. & N. W., Webb \* Oct 18 \* Dec 6-89; experimental (compound tubular), Chemin de fer d'l Est, France \* Nov 13-91; construct. \* Jan 1, 8 \* Feb 5; Leahy, cor. \* Apr 22; double, Eastern R., France \* Mar 4, 11; Great Western, converted \* Oct 21, 28-92

ALTOONA and Penn shops, notes, ed *E. News* Apr 26-90

BELPAIRE, and the radial stay, and ed. *R Gaz* \* Aug 1, cor. \*

Sep 26, 26-90; 62-in., Ill. Cen. \* Nov 20-91

CLEANER, the Trowbridge *R Gaz* \* Jan 17-90



## LOCOMOTIVES, BOILER EXPLOSIONS—CAVAN 213

- Locomotives, EXPLOSIONS, remarkable, Atlan. & Pac. *E News***  
 \* Jan 14-**88**; remarkable, Norwegian State R's \* June 7-**90**;  
 on Brit. R's *R & Eng* \* Jan-Apr -**88**; in Europe *R Gaz* \*  
 Jan 18-**89**; in France and Algeria *The Eng* Aug 31, 31-**88**,  
 in France since 1840 *An Indus* July 29-**88**; France, Bel-  
 gium, Holland and England *The Eng* Jan 11 \* Feb 1, 22-**89**
- FIRE-boxes, the Darby crown sheet, Grand Trunk R., Can.**  
*Eng* \* Aug 24-**88**; Webb's \* May 17, 17; corrug. steel, Lond.  
 & N. W., Webb \* Aug 23-**89**; the steam-jet as a means for  
 preventing smoke *E News* \* Apr 4-**91**; ed. *R & Eng* Jan;  
 corrug. tubular, Knaudt, abs. June; fire-brick lined (full) \*  
 Oct, Phelps, cor. Nov -**89**; corrug., Lentz, Apr -**90**; For-  
 ney's door opener \* June; corrug. \* Sep -**91**
- R Gaz* and coal burning, Higginson, and ed. July 20-**88**;  
 Master Mechanic's com. report, June 27-**90**; staying, Woods,  
 Apr 17; Haworth's door opener \* May 1; Ten Brinck fuel  
 saving tests, Orleans R., France \* 8, 22-**91**, *Ing Civils*;  
 Webb's steel *The Eng* \* June 14-**89**
- JOHNSTONE** compound *R Gaz* \* May 27-**92**
- KNAUDT & Pohlmeier's, Prussian State R's *Eng* \* Oct 4,  
*R Gaz* \* Nov 15-**89****
- LENTZ's** stayless *Eng* \* Dec 19, *R Gaz* \* Apr 4-**90** \* Jan 9  
 -**91**
- SPEIRS' construct. *E News* Jan 23, Dean, 30, (full) *R Gaz* Jan  
*22-92***
- WOOTEN, U. Pac. express pass. *R Gaz* \* June 15 \* July 6-88  
**BOSTON & Albany 4-wheel switching *R & Eng* \* Nov, Dec -91**  
**BRAKE gear diags., Am. Brake Co., cor. *E News* \* Jan 26-89**  
**BRISTOL & Exeter express *The Eng* \* May 9, 9-90**  
**BUILDING, Am., '88, n *Eng* Mar 8-89; in New So. Wales, June**  
**6-90; in '89 *E News* Feb 1; 40 years' course of, French, inset**  
*The Eng* \* June 20, July 18-**90****
- CAB, Balt. & Ohio *R Gaz* \* Dec 16-92**
- CALEDONIAN R. bogie pass. *The Eng* Apr 13, 13-88; No. 123,**  
 performance, diags. \* Mar 13-**91**
- CANADIAN Pac. 10-wheel heavy pass., inset *Eng* \* Jan 17, inset**  
*E News* \* Aug 30-**90**; mogul, inset *R Gaz* \* May 31, inset  
*The Eng* \* June 21-**89**
- CAPE Gov't. R's, coal burning of Colonial coal on, Stephens. ir-**  
 sets *Inst M E* \* Jan -**90**
- CAVAN R., light locom. *The Eng* Apr 20, 20-88**



## 214 LOCOMOTIVES. CHESAPEAKE - COMPOUND

**Locomotives**, CHESAPEAKE & O. 10-wheel pass., Rogers works  
*R & Eng* \* July -90; tank switching, 2500 gals. *R Gaz* \* July  
 27-88

CHICAGO, Bur. & Q. pass., inset *E News* \* June 28; standard  
 mogul \* July 5-90; suburb. pass., inset, ed. *R Gaz* \* Dec 13-  
 89; 75-ton decapod, Rogers works, inset \* July 24-91

CHICAGO, Mil. & St. P. express *R Gaz* \* Feb 20, details \* Mar 6-91  
 CLEVELAND, Cincin. Chic. & St. L. *R Gaz* \* Jan 1-92

COALING chutes *R Gaz* \* Dec 11, 18-91; coaling stations, Berg,  
 Feb 5 \* 19-92

COMPOUND *Eng* E. Worthington, Jan 11; Lapage \* Mar 22, 29 \*  
 Apr 5-89; English pats. on, abs., Feb 27, Apr 17-91; Sinclair  
*E News* Apr 20; Am. \* Nov 30-89; Am. Master Mech's com.  
 report, and ed. June 28, 28-90

*E & Min* compounding petrol. refuse burning, Russia,  
 Urquhart, abs. Sep 14-89, insets, discuss. (full) *Inst M E* \* Jan  
 -90; Lapage, discuss., insets \* Jan -89; the compound prin-  
 ciple applied to, E. Worthington, insets *Inst C E* \* v 96-89;  
 Polonceau, n v 99 -90; Brueckmann, abs. v 104 -91, *Soc Ing*  
*Civils* Oct -90; relative value of different types, abs. *Inst C E*  
 v 106 -91, *Am Mas Mech* 24th report

*R & Eng* 4-cyl., Bousquet, and ed. \* Mar -89; Master  
 Mech's com. report, July -90; development of compound sys-  
 tem, Mallet (full), Feb, ed. \* Mar - June -91; Webb, Jan;  
 early description, n \* June, ed. Sep -92, *F Inst*

*R Gaz* in Am. service, ed. \* Feb 15, 22; Sinclair, N. E. R.  
 Club discuss. Apr 19; May 10; starting power of, Neale, cor.  
 Aug 18; Barnes, discuss. Oct 18; India, Hughes \* Nov 22; ed.  
 \* Dec 20-89; mathematics of, French, Mar 7; Polonceaux, Apr  
 18; Master Mech's com. report, June 27; early, Perry & Lay \*  
 Sep 19-90

*R Gaz* pats. on (list), Feb 13, English \* 20; braking power  
 of steam cyls. of \* Apr 3; relative value of different types,  
 Master Mech's discuss. \* June 26; cyl. proportions, Oct 2; U. S.,  
 table, Dec 18-91; in frt. and pass. service, Woods, Jan 1; trip-  
 expan. n May 13; three-cyl. \* Dec 30; Master Mech's com.  
 report, abs. July 1, (full) *Ry Age* sup. June 24-92

*Sc Am Sup* compound prin. applied to locoms., E. Worthing-  
 ton, Mar 30-89; steam distrib. in, Snow \* May 10-90, *R Mas*  
*Mech*; comp. prin., Worthington *The Eng* Jan 25-89; cyls.  
 Harrison, cor. \* June 6-90; Rickie, cor. Oct 23-91



**Locomotives**, COMPOUND, ARGENTINE Great Western, burning liquid fuel *The Eng* \* May 15-91

ARGENTINE Midland R. *The Eng* \* Dec 27, 27-89

AUSTRALIA, Baldwin, tests of Vauclain (full) *R Gas* May 29 \* Aug 7-91

BALDWIN four-cyl. and ed. *R Gas* \* May 2, 2-90; \* May 1, table, Nov 27-91. See also LOCOMS., comp., Balt.

BALTIMORE & O., Baldwin, details, inset *E News* \* May 3, 3, tests of and ed. Sep 6 \* 13, 13, narrow-gauge \* Dec 13; tests, Barrus (full), and eds. Sep 12, 12, 19 *The Eng* \* Sep 19, 26-90

BACHELLER'S pat. valve *R & Eng* \* May; R. I. Locom. works, Franklin Inst. medal *R Gas* June 3-92

BROOKS two-cyl. *R Gas* \* Nov 25-92

CHICAGO Mil. and St. P. tests, inset *R Gas* \* Aug 5, 5-92

DEAN'S *R Gas* \* Nov 25-92

EAST Tenn. Vir. & Ga. indic. diag. *E News* \* Nov 22-90; ten months' test of, Dec 5-91

FRENCH *R & Eng* \* Aug -89; recent *R Gas* \* Jan 3-90

GERMANY, in, Stambke *E News* \* Apr 19, May 3-90

GRAZI-Tsaritsin R. goods, petrol. refuse, Urquhart *The Eng* \* Jan 31-90

HUNGARIAN State R's *E News* \* Feb 6-92

JOHNSTONE'S double truck, Mex. Cen. *E News* \* Aug 29-91 \* Mar 12-92; abs. *Inst C E* v 106-91; Mex. Cen., tests (full) *R Gas* \* May 22, 29, Oct 9; 10-wheel, inset \* June 5; trials anal., cor. Sep 25-91; double bogie, Mex. Cen., inset \* Mar 25, test \* Aug 26 (full) \* Dec 30, 30-92. See also LOCOMS., comp., Mex. Cen.

LAKE Shore & Mich. So. frt. *R & Eng* \* Dec -92

LINDNER'S starting gear, system for *E News* \* June 16, do. *R & Eng* \* Dec -92, do. *R Gas* \* Nov 15-89; do. in Russia \* Mar 13, 27-91 \* Sep 2-92 *The Eng* \* May 23-90

LONDON & No. W., Edinb. exhib., inset *Eng* \* July 25-90; Webb's, with Joy valve gear *E News* \* Jan 26-89; frt. *R & Eng* \* Feb; Webb's *The Eng* Dec 21, 21-88

MALLET'S, Decauville R., Paris exhib. *Eng* \* May 3, do. *E News* \* June 1-89; largest and smallest *R Gas* \* Aug 15-90; prog. in use of \* Feb 6, arguments pro and con, Polonceau, 13-91, *Ing Civils*; Paris exhib. *The Eng* \* May 21-89



- Locomotives, COMPOUND, MEYER-Lindner duplex, Roy. Saxon**  
 St. R. *R Gaz* \* Sep 2-92
- MEXICAN** Cen. 10-wheel Johnstone's double truck, inset *E News*  
 \* Aug 29-91 \* Mar 12, inset (full) \* 26 \* Apr 2, valve motion  
 \* 9-92; Johnstone, tests *R & Eng* \* June, n Aug -91, Nov  
 -92, do. *R Gaz* May 29, Oct 9-91, test \* Aug 26-92
- MEXICAN** National R., dimens., news n *E News* Dec 13  
 -90
- MICHIGAN** Cen., Schenec. works *Eng* \* Apr 4-90 *E News*  
 Jan 25, and ed. \* Mar 8-90; ed. *R Gaz* \* Jan 31, ed. Feb  
 14-90; 10-wheel pass. \* Jan 23-91
- MISSOURI**, Kan & Tex., and simple, comparative tests *R Gaz*  
 Nov 11-92
- NORTH** Eastern R., England, express, Worsdell, inset *Eng* \*  
 Mar 30 \* Apr 13-88 \* June 21, 21-89; pass do. *R & Eng*  
 \* May -90; tank engine *The Eng* Oct 26, 26, goods tank,  
 Nov 23, 23-88; express, inset \* Feb 28 \* Mar 7-90
- NORTHERN** R. of France, goods, Paris exhib., inset *Eng* \*  
 Dec 6-89; 4-cyl. fast pass., Bousquet, n *R & Eng* Jan \*  
 Aug *R Gaz* \* Aug 12 *The Eng* \* Sep 2-92
- PARIS**, Lyons & Med. R. *The Eng* \* Aug 9-89
- 'PENN.'** the *R Gaz* \* May 3-89
- PITKIN'S** pat. *R & Eng* \* Mar -90
- PRUSSIAN** State R's, goods, Worsdell system, inset *Eng* \* Feb  
 1-89
- RHODE** Is. Locom. works, com. report, insets (very full) *F Inst*  
 \* May -92; Batcheller, bk. review *R & Eng* Jan -91; test  
 in express service, Jan -92; and simple, study of, expts.  
*R Gaz* \* Jan 9; system of (full) \* Dec 11-91
- RUSSIA**, petrol. fuel, Urquhart *Eng* Feb 7 \* 21 \* Mar 7, do.  
*E News* \* June 14-90
- ST. Gothard** R., duplex *E News* \* Aug 15-91
- ST. Petersburg & Warsaw** R., pass., inset *Eng* \* Sep 9, *R &*  
*Eng* \* Nov -92
- SAXON** State R's express, dimens. *R Gaz* \* Nov 22, 29-89
- SOUTHERN** Pac. *E News* \* Apr 28-92; 10-wheel, inset *R Gaz*  
 \* Sep 11-91
- SWISS**, Jura-Berne-Lucerne R., pass. mogul, inset *Eng* \* Feb 7;  
*R Gaz* \* Sep 12-90
- TESTS**, Baldwin, Balt. & O. and ed. *E News* \* Sep 6, 13, 13;  
 Union El. R., Brooklyn, in fast pass. service, Dec 27-90



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\* Jan 8; 10 months, E. Tenn. Vir. & Ga. Dec 5, 12-91; Vauclain \* June 23, ed. 30, 30, indic. diag. \* July 7-92; Johnstone, Mex. Cen. *R & Eng* \* June \* Aug; W. N. Y. & Pa. R. Oct -91; R. I. works, in express service, Jan; Johnstone, Mex. Cen. Nov -92

*R Gas* B. & O., Barrus, (full) Sep 12, 19-90; R. I. works expts. \* Jan 9; Johnstone's (full) \* May 22; Vauclain, May 29, \* Aug 7; Johnstone, trials anal., cor. Sep 25; and simple, comparative, W. N. Y. & Pa. Oct 2, Baldwin, Mex. Nat. Dec 4-91; Johnstone, Mex. Cen. \* Aug 26; and simple, comparative, Mo. Kan. & Tex. Nov 11-92; comparative, Hudson *Sc Am Sup* Jan 23-92, *J Assoc E Socs*; B. & O. *The Eng* \* Sep 19, 26-90

VALVE gear, variable expansion, Dunlop, cor. *Eng* \* Feb 13-91; for Hope & Co., cor. *R Gas* Sep 19-90

VAUCLAIR, 4-cyl. *E News* \* May 3-90 \* Feb 20; tests \* June 23, ed. 30, 30, indic. diags. \* July 7-92; com. report *F Inst* \* July -91; patent, n *R & Eng* Jan -90; tests *R Gas* May 29, Australia, Baldwin, tests \* Aug 7-91; Manitou & Pike's Peak rack R., n \* Aug 12-92

VON BORRIES', starting valve for (full) *R Gas* \* June 12-91. See also LOCOMS., comp., Worsdell & Borries

WEBB's, Lond. & N. W., with Joy valve gear *E News* \* Jan 26, *Eng* \* June 7-89, *The Eng* Dec 21, 21-88

WOOLFE 4-cyl. double-expan., ed. (full) *R Gas* \* Mar 8, 8-89

WORSDELL, N. E. R. express, inset *Eng* \* Mar 30 \* Apr 13-88; Worsdell & Borries' system, goods, Prussian State R's, inset \* Feb 1; N. E. R. express, inset \* June 21, 21-89, do. *R & Eng* \* May -90; applic. to Am. type of locom. *R Gas* \* Dec 14-88; Grand Trunk R. \* Nov 6-91; Bengal R. *The Eng* July 20-88

WRIGHT's *R Gas* \* Jan 30-91

COMPRESSED air, 40 and 50 ton, Mekarski system, for Paris, France *E News* \* May 31-90. See also STREET railroads, compressed air motors

CONNECTING rods, side rods, N. W. R. Club discuss. *R Gas* Nov 21-90; and crank pins, Chic. B. & Q. R. \* Jan 16-91; parallel rod resistance, Apr 8-92; *The Eng* May 25, June 22-88



**Locomotives**, COUNTERBALANCING, recip. parts, Lanza *Am M E* \* v 10-89; W. H. Lewis *E News* \* Apr 28-90; eds. *R & Eng* \* Feb - Apr -90; Hill *Inst C E* \* v 104 -91; Lanza *R Gas* \* Oct 19-88; Booth, cor. \* Oct 11-89; in 3-cyl. compound, cor. and ed. \* Mar 21, review of, 21, Booth. cor. and ed., Apr 4; W. H. Lewis \* 25; Western R. club discuss. May 30-90, Barr discuss. do. \* Mar 6-91; expts. on methods, Lanza *Tech Q* \* Feb-89

CRANK-pin turning machine, Urquhart *Eng* \* Apr 12: at Paris exhib. \* Sep 27-89

CRANK shaft, expts. with, Ivatt *R & Eng* \* July -91, steel, test of, do. *The Eng* \* Apr 8-91

CYLINDER cock, Riggins's combination *R Gas* \* July 4-90

CYLINDERS, design, Barker, inset *Inst C E* \* v 106 -91; steam action in at high speeds, ed. *R Gas* Nov 22-89; proper capacity for pushers on grades, ed. \* Dec 19-90; means for increasing power at speed, ed. Oct 23-91; and slide valves, Lond. Br. & So. C. *The Eng* Aug 23-89

DELAWARE, Lack. & W. mogul frt. *R Gas* \* Feb 3-88

DOUBLE end saddle tank, Porter *R Gas* \* June 14-89

DOWNWARD draft, Complete Combustion Co. *E News* \* Aug 2 -90

DRIVING-box linings, opinions, table *R Gas* Mar 28-90

DRIVING-wheels, 'imperceptible slip,' Sargeant, C. B. & Q., tests of, table *E News* June 14; ap. for removing paint from, Horton \* Oct 11-90; Vauclain's centers, com. report *F Inst* \* July -91; big *R & Eng* Nov -92; size of express, ed. *R Gas* Oct 26-88; 7½-ft. cast steel, N. E. R., England \* Mar 7-90; Vauclain's wrt. iron centers \* July 10-91; best size of, Greenhill *The Eng* Mar 29-89; polygonal \* Apr 4-90

DRIVING-wheel tires, Bess. steel, Arnold *Eng* Dec 7-88; wear of, cyl. wheels and flat-topped rails, Whittemore *E News* \* Feb 9, and ed. 16, 16, 23, ed. Mar 2; tests, Mich. Cen. \* May 11-89; retaining ring for \* July 19; hollow, dangers of in contact with frog points, Perry \* 26; breakages in Germany, Aug 9; steel, and attaching do. with different fastenings, Rhodes, Nov 8 \* Dec 6-90; irreg. wear of, Barr \* Feb 7-91, do., Herr \* June 16-92

*Inst C E* and rails wear on curves, Helmholtz, abs. v 93-88; Bess. steel, influence of chem. composition on strength, Arnold. discuss. \* v 95 -89; oil-gas tire setting ap., G. T. R., Wanklyn.



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### Locomotives, DRIVING-wheel tires

abs. v 104-91; and axle specs., English *R & Eng* \* Aug; German fastenings \* Aug -91

*R Gas* wear of, table, Master Mech's com. rep. June 22-88; steel, influ. chem. compos. on strength, Arnold, Mar 8-89; steel and Ross-Meehan shoe, N. E. R. club discuss. Oct 17; steel, attaching to center, Rhodes, Nov 7, fastenings, do. \* Dec 5-90; irreg. wear of, Barr \* Feb 6; wear, flat spots on \* Mar 20; steel, tests, Roussel \* Apr 3-91; stresses in, cor. Jan 22; irreg. wear of, Barr \* June 17; shrinkage of, table, July 15; wear, Herr, discuss. \* Oct 21-92

EASTERN R. of France, tank, Paris exhib., inset *Eng* \* Aug 30 \* Sep 20-89; Flaman boiler (compound), inset \* Mar 25 \* Apr 8, 22; fast *R & Eng* \* Mar -92; express experimental *The Eng* \* Nov 18-91; double-boiler express, inset \* Mar 4, 11 -92

ELECTRIC, Manhattan Elevated R., and steam, comparative tests, Moss, insets *Am C E* \* v 23-90; A. Siemens *El Rev Lond* \* Aug 12, do. results, City & So. Lond. *R. Eng* \* Aug 19, do. *E & Min* \* Sep 3-92; and steam, compar. tests, effic., Moss *E Rec* July 19, do. *The Eng* Aug 29, do. and ed. (full) *R Gas* \* July 11, Moss, cor. 18-90; Weem's high speed, expts., Crosby (full) Mar 18-91; as substitutes for steam locoms., Woods, June 24-92; Daft, trial, N. Y. El. R. *Sc Am Sup* \* Mar 2-89

ENGINE drivers, hours of *Eng* Jan 30-91

ENGLISH, and Am. and ed. *E News* Aug 2, 2, discuss. Oct 11-90; use of truck on *R & Eng* \* Aug; express, Paris exhib. \* Nov -89 *The Eng*. See also LOCOMS., Am. and English—erecting

ERECTING *Eng* \* Dec 18-91; English *R Gas* \* Sep 28; at Altoona *The Eng* Sep 28-88

ESTRADE's high-speed, Paris *Sc Am Sup* \* Apr 28 *The Eng* Mar 9, 9-88

EXHAUST, nozzle, Macallan's variable *Eng* \* Aug 22-90; muffler. Penn. R. *E News* \* July 21-88; pipe, Smith's triple-expan. Mar 16-89; pipes, nozzles, etc., Am. R. Master Mech's report \* June 20-91; nozzles, single and double, ed. *R Gas* \* May 16 -90; pipes report \* June 19; nozzle, Mertsheimer's variable \* July 31-91; ap., common sense about, ed. \* June 17-92

FAIRLIE system, Mex. Cen., inset *Eng* \* Mar 14-90



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- Locomotives**, FEED water heater and purifier, Barnes' *E News* \* Aug 9 *R Gaz* \* July 25-90; purification, Northwest R. club discuss., C. N. Hunt, Dec 13, 20-89
- FIRE-boxes, brick arches in, Am. R. Master Mech's com. report *E News* Aug 9-90. See also LOCOMS., boilers, fire-boxes
- FIRE extinguisher, Penn. R. *R Gaz* \* July 19-89
- FREIGHT, hauling capacities, table *R Gaz* Nov 21-90
- FRENCH, Paris exhib. *R & Eng* \* Nov, pass. \* Dec -89; tank \* Feb -90 *Eng*; notes *R Gaz* \* Jan 16, 23-91; Chemin de fer d l'Ouest, express *The Eng* \* Oct 4, 11-89. See also LOCOMS., Eastern R. of France
- FUEL, premiums, Russia, Borodine *R Gaz* Sep 27-89; Yates' mileage card, Aug 1-90; petroleum, liquid fuel on *Eng* \* Oct 19-88, working of, Urquhart \* Feb 8, 15-89, do. tests *E News* \* Feb 2-89, burning \* Aug 25-92, do. Dudley *F Inst* \* Aug -88, in So. E. Russia, Grazi & Tsaritsin R., Urquhart, discuss., insets *Inst M E* \* Jan -89 *R & Eng* \* Jan -89, on Great Eastern R., England, Booth *R Gaz* \* Feb 26-92 *Sc Am Sup* \* Nov 24-88, working with, Urquhart (full) \* Sep 27 \* Oct 4-90. See also LOCOMS., boilers, liquid fuel
- FURNACE coal burning, Higginson *R Gaz* \* Nov 23-88. See also LOCOMS., boilers, fire-boxes
- GEORGIA Pac., 10-wheel *E News* \* Apr 5-90
- GLASGOW & So. West., pass., inset *The Eng* \* Mar 1, 22-89
- GRAND Central R., Belgium, tank, inset *Eng* \* Aug 16-89
- GRAND Trunk of Canada, express, inset *Eng* \* Dec 14, 21-88 *Sc Am Sup* \* Feb 16-89
- GRANT works, Chic. *R Gaz* \* May 15-91, Cicero, Ill., inset \* June 17-92
- GRAZI-Tsaritsin R., So. E. Russia, 8-wheel *The Eng* \* Sep 4, 11, 11-91
- GREAT Britain and Ireland, number *The Eng* Sep 2-92
- GREAT Eastern R., England, express, inset *Eng* \* May 4-88, inset \* May 27-92, *The Eng* \* June 12-91
- GREAT Northern R., England, express *The Eng* June 8-88 \* Nov 6-91, insets \* Dec 16, 16-92; of Scotland, pass., inset *Eng* \* May 23-90
- GREAT Western, England, broad and narrow gauge convertible, inset *Eng* \* July 8-92; works, Swindon *The Eng* Nov 16-88; early \* May 20, 27-92



- Locomotives, HEADLIGHT**, elec., Pyle's *El Wld* \* Sep 27-90, abs. *Inst C E* v 103 -91; elec. *R Gaz* Nov 29-89, Jan 17-90
- HIGHLAND R., Scot., standard pass., inset *Eng* \* Oct 9 *R & Eng* \* Dec -91
- HISTORY**, the DeWitt Clinton, G. H. Thomson, inset *Am C E* \* v 23-90; old, the 'Sampson,' Robb *Am M E* v 10 -89; early, see H. Allen, v 11 -90; early, the steam buggy *E News* \* Sep 8-88; early, Horatio Allen \* Jan 11; the John Bull \* 18; hist. of development, ed. 18-90; Tomlinson, Pres. addr., insets, (full) *Inst M E* \* May -90
- R & Eng* \* Feb - Apr -90; Camden & Amboy R., Norris, n \* Jan -92; hist. of articulated, Brunner *R Gaz* Sep 25-91
- Zeit Deut Eisenbahn*; early, Am. type and equalizing lever, Eastwick *R Gaz* \* Apr 22, 29-92; the rail, spike and locom., Watkins *Sc Am Sup* Dec 12-91 *The Eng* \* Mar 7-90
- HOELLENTHAL R., inset *Eng* \* Feb 6-91
- HOIST, Chic. & No. W. *R Gaz* \* Feb 5-92
- HUNGARIAN State R's, tank *The Eng* Feb 3, 10-88
- ILLINOIS Cen. suburban, tests (full) *R Gaz* \* June 17-92
- INDIA, Sind Pishin section, Indian State R's *Eng* Apr 13 \* 20-88, inset \* Apr 19-89, 6-coupled, meter gauge *The Eng* Mar 28-88; Indian Midland tank \* Nov 22-89
- INDICATOR diags. at high speeds *E News* \* June 9, compound and ordinary, comparison \* July 7-92; indicating. Lyne, *R Gaz* \* Aug 2, Manning, cor. 16-89, do. Dean \* Feb 28; indicator cock, 4-way, Gifford \* Mar 7; diags., Worsdell's high speed compound \* Mar 28, No. E. R., England and ed. (and train resistance) 28-90
- IRON Range & Huron Bay heavy frt. *E News* \* June 16, 12-wheel, inset \* July 7-92
- ITALIAN pass. *R & Eng* \* June -90; Ital. Med. R. *The Eng* Nov 9-88, pass. \* Feb 1 \* Mar 29, goods, Sep 6 \* Dec 20-89, Paris exhib. \* Feb 21-90
- JAPAN Imperial R's tank, inset *Eng* \* Feb 10-88
- LAKE Shore & Mich. So. express, Brooks works (details), inset (full) *R Gaz* \* Nov 16-88
- LANCASHIRE & Yorkshire, England, pass., inset *E News* \* Mar 28; 6-wheel frt. *R Gaz* \* Jan 30; tender water-scoop \* Dec 25-91; standard goods, inset *The Eng* \* Jan 1-92
- LONDON, Brighton & So. Coast pass. *R & Eng* Sep, express pass., Paris exhib. *The Eng* July 19, 19-89



- Locomotives**, LONDON & No. W., Crampton engine, 1847, inset *The Eng* \* Nov 28-90; compound express \* Nov 20-91
- LONDON & So. W. works *The Eng* Sep 28-88; tank, inset \* Feb 5-92
- LONDON, Tilbury & So. tank *The Eng* \* Nov 25-92
- MANHATTAN Elevated R., N. Y. n *R & Eng* \* Jan -90
- MEDITERRANEAN R. *The Eng* \* Mar 13-91
- METROPOLITAN R., Lond., 4-wheel tank, inset *Eng* \* Dec 18-91; Met. Dist. R. pass. tank *E News* \* Mar 22-90, inset *The Eng* \* May 17-89
- MEXICAN Cen. (Fairlie system), inset *Eng* \* May 14-90; average econ., Johnstone, cor. *R Gaz* Nov 20-91
- MICHIGAN Cen. 10-wheel express *R Gaz* \* Feb 24-88
- MIDLAND R., England, express, inset *Eng* \* Mar 2, 16-88, exp. pass., Paris exhib. *The Eng* Sep 20-89
- MINERAL tank, Barry R. *Eng* \* Dec 2-92
- MOUNTAIN, two rack-rail, Abt system, Brunig R. and Riggenbach system, Brazil *E News* \* Nov 9-89. See also RAILROADS, mountain
- NARROW gauge frt., for So. Am. (meter gauge), Sharp Stewart, Glasgow *E News* \* May 17; compound, Baldwin \* Dec 13-90
- NEWPORT News & Miss. Val. 10-wheel frt. *R Gaz* \* Mar 16-88
- NEW So. Wales Gov't. R's, Baldwin 10-wheel *R Gaz* \* May 29-91 *The Eng* Nov 23-88 (full), July 1, Oct 14-92
- NEW York Cen. & H. R. 19 x 26 Brooks mogul, inset *R Gaz* \* July 25-90; suburban, inset \* Sep 11-91
- NEW York, L. Erie & W. express, inset *R Gaz* \* Jan 6-88
- NEW York & Northern, Rogers works, suburban service, n *R & Eng* \* Oct -88
- NEW Zeal. Gov't. R's tank, inset *Eng* Jan 29-92, do. for heavy grades, inset *E News* \* Nov 14-91
- NORTH Land. R. tank goods, inset *Eng* \* Oct 8-90, pass., inset \* Jan 9-91
- NORTHERN Pac. consolidation, inset *Eng* \* Oct 25, *Sc Am Sup* \* Dec 7-89
- OLD Colony R., simple and compound, tests, tables *R Gaz* Sep 16-92; pass., inset *The Eng* \* Nov 14-90
- OSCILLATIONS ap., West. R. of France *Eng* \* Jan 10; registering ap. *E News* \* Feb 8-90
- PENN. R. pass. *The Eng* \* Oct 17, 17-90



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- Locomotives**, PHILADELPHIA & Reading heavy consol. *R Gaz* \* Jan 4-**89**; express \* Apr 15-**92**
- PIECE-work classification (full) *R & Eng* Jan - Mar -**92**
- PISTON, rod breakages, report *R & Eng* \* Nov; Am. balance piston *R Gaz* \* Jan 3-**90**
- PRUSSIAN *R Gaz* July 11-**90**
- RACK rail. See LOCOMS., mt; RAILROADS, mt.
- RAUB, the, n *The Eng* Dec 7-**88**
- RESISTANCE, engine and ed. *E News* Jan 5, 5-**89**
- REVERSE lever, Cumb. & Pa. R. *R Gaz* \* May 23-**90**
- RICHMOND works *R & Eng* \* Oct -**90**
- RUSSIAN heavy frt. *R & Eng* \* Sep -**92**
- St. Clair tunnel decapod tank frt., inset *R Gaz* \* Apr 3, 10-wheel *The Eng* \* Apr 24 \* May 29-**91**
- St. Gall & Garis mt. road R., Switz., inset *Eng* \* Dec 30, 30-**92**
- SANDING ap., steam *Eng* \* June 29, do. *R & Eng* \* Aug, do. *R Gaz* \* Sep 14-**88**; Leach's sand feeding ap. *E News* \* Feb 13-**92**
- SAXON State R., 4-cyl. compound *The Eng* \* Oct 23-**91**
- SCHENECTADY works *R Gaz* \* July 15-**92**
- SHAY, the, Gilpin Tramway, Col. *E News* \* Apr 26-**90**, inset *R Gaz* May 8-**91**
- SLIDE valves, friction of, Aspinall, discuss., insets *Inst C E* \* v 95 -**89** *The Eng* Dec 28-**88**; and cyls., Lond. Br. & So. C. R. Aug 23-**89**
- SMOKE-stacks, and exhaust nozzles design, W. H. Lewis *E News* \* June 23-**92**; cast iron *R Gaz* \* Apr 18-**90**; Manhat. eleva. R. \* Mar 4-**92**; straight, theory of, Snow *Sc Am Sup* \* Apr 13-**89** *Am Mas Mech*
- SOUTH Eastern R., England, express pass., Paris exhib., inset *Eng* \* Apr 25 \* May 2 *E News* \* Feb 22-**90**, inset *The Eng* \* Nov 29 \* Dec 13-**89** \* Jan 3-**90**
- SOUTHERN R., Italy, goods, inset *Eng* \* Oct 31-**90**
- SOUTHERN Pac. R., 8-wheel, diag. *E News* \* Apr 25-**91**
- SPARK arresters, Bell's *R & Eng* \* Mar; Brown's and smoke stack *R Gaz* \* Nov 14-**90**
- SPRINGS and equalizers, Master Mech's com. report *R Gaz* \* June 29-**88**
- STRONG, the, distrib. of steam in, Dean *Am M E* \* v 9-**88**, sup. v 10-**89**; inset *Eng* \* May 17, 17, cor. June 7-**89**; Strong Manuf. works \* June 6-**90**; remarkable run *E News* Apr 6-



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**89** *F Inst* \* Feb -**88**; steam distrib., Dean *R Gaz* May 25-**88**; the 'A. G. Darwin,' inset \* Jan 11; indic. diags. June 28 \* July 26-**89** *Sci Am* Jan 12-**89**; insets \* *Soc Arts Mass* -**88**; Tratman *The Eng* Sep 13-**89**

SWEDISH pass. *R & Eng* \* May -**88**

SWINERTON polygonal driving-wheel *E News* May 24, Swinerton, cor. June 28-**90**

TAFF Vale R. 10-wheel tank pass., inset *Eng* \* Aug 2, 9-**89**

TENDERS, Wabash R. *E News* \* Dec 1-**92**; truck, U. P. standard *R Gaz* \* Dec 7-**88**; axles, muck-bar, tests, Watertown arsenal, Howard (full) Jan 4; trucks, Hickey, Feb 22, Mar 1-**89**; iron frame, N. Y. L. Erie & W. \* Apr 18; heavy axles, Master Mech's com. report \* June 20; iron frame, Brooks works \* Nov 7-**90**; hopper, Wabash R. \* Nov 18-**92**

TESTS, and elec. motor, comparative tests, Manhat. El. R., Moss, insets *Am C E* \* v 23-**90**; standard method, prelim. report *Am M E* \* v 13; experimental, Goss \* v 13-**92**, do. *E News* \* May 19, 19-**92**; Penn. R. n Apr 26-**90**; expts., Donkin *Eng* \* Oct 21-**92**

*R Gaz* trials, Manning \* July 12, 19; in Chili, Stillman, Dec 27-**89**; standard method, Dean \* June 20, 27; testing, Manning, July 18; the calorimeter in testing, Barrus \* Oct 17-**90**; Baldwin 10-wheel, B. & O., ed. (full) \* Nov 27, 27 \* Dec 11-**91**

*R Gaz* Old Colony, table, May 27; standard, com. report (full) 27; Ill. Cen. suburban (full) \* June 17; simple and compound, O. Col., tables, Sep 16; Schenec. prelim. Oct 7-**92**; Am. performance, n *The Eng* Apr 20-**88**; trials, Chili, Feb 14-**90**; experimental, Goss \* June 3-**92**. See also LOCOMS., compound; RAILROADS. speed

TIRE testing machine, Chapelle works, Paris *The Eng* Jan 6-**88**

TRACK tanks, Balt. & O. R., Andrews *R Gaz* Oct 28-**92**

TRACTION, tractive power, diag. *E News* \* Sep 7-**89**; the Ries traction increaser \* Aug 9-**90**, ed. \* May 9-**91**; tractive power, n *R & Eng* \* Sep -**89**; how does it pull itself \* Apr -**92**; tractive force and train resistance *R Gaz* \* Oct 24-**90**, do. Slack *Steven's Indic* July 15-**88**; and driving, the mechanics of, R. H. Smith (full) *The Eng* \* May 13 \* June 3-**92**

TRALEE & Dingle R. narrow gauge *The Eng* \* July 15-**92**

VALVE, Child's cyl. *R & Eng* \* Jan -**89** \* May -**92**



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- Locomotives**, VALVE gears, Bonnefond's *Eng* \* Dec 20-89, do.  
*R Gas* \* Jan 17; Hunt's pat. *R & Eng* \* June -90; Rickie's,  
 Cawnpore st. R's, India *The Eng* July 6-88
- WABASH** 10-wheel express, inset *R Gas* \* Oct 17-90
- WATERFORD & Limerick R.** *The Eng* \* Sep 12-90
- WEIGHING** machine, Paris & Orleans R. *Eng* \* Nov 29-89
- WESTERN R.** of France, Paris exhib. *Eng* \* Oct 18; tank \* Nov  
 22-89; pass., inset \* June 6, 18-90
- WOOTTEN**, the, com. report *F Inst* \* Sep -91; U. P. express  
 pass. (boiler) *R Gas* \* June 15, details \* Oct 5 *The Eng* July 6  
 -88
- Lock**, Havre transatlantic, iron gates, Widmer, abs. *Inst C E* v 92  
 -88 *An Ponts* \* v 14 -87. See also CANALS, locks
- Lock-nut**, the Cluther *The Eng* Sep 28-88. See also TRACK,  
 lock-nuts
- Locks**, elec. applic. to, Kintner *El Eng* \* Jan -88
- Lockwood**, John, n *Am C E* v 27-92
- Lockwood**, Thomas D., por. *El Wld* \* Sep 14-89
- Lodge**, Oliver J., por. *El Wld* \* May 9-91, por. *Sc Am Sup* \*  
 Nov 1-90
- Logarithms** *Pwr* Jan -92
- Logger**, steam *Sc Am Sup* \* Apr 14-88
- Logs**, loading on cars, M. C. B. standard *E News* \* Nov 1-90;  
 new proc. for comput. of, May 5-92
- Logwood**, extracts testing, Palmer *F Inst* Apr -89; extractive  
 matter of, Macfarlane, Mar -90
- London**, elec. lighting of, ed. *Eng* May 24-89; growth, *E News*  
 Aug 15-85; July 22-88; water Co's remarkable hist. Aug.  
 17-89; street traffic, July 5; smoke, value of, n Dec 6-90;  
 traffic, Howe report sup. Jan 2; Met. Gov't., ed. Apr 21; rapid  
 transit \* Nov 24-92, do., Reckenzaun *St R J* May -91; main  
 drainage report *The Eng* Mar 18-91; new streets between  
 Holborn and Strand, proposed, map \* July 15-92. See also  
 HYDRAULIC power distrib., Lond; PAVEMENTS; RAILROADS,  
 underground; SEWERS; WATER-works, etc.
- Loring**, Charles A., por. *Cassier's* \* Dec -91
- Louisiana** quarantine system, Holt *Sc Am Sup* \* Jan 7 \* Feb 4  
 -88
- Loveridge**, Henry, por. *E & Min* \* Dec 18-90
- Low**, Thomas B. *Inst C E* v 91 -88
- Lubbock**, John, por. *Sc Am Sup* \* Mar 22-90



**Lubrication**, viscosity, detn. of, Denton *Am M E* v 9-88, measurement of durability of lubricants, do. \* v 11-90, expts. with, do., Bissell, v 12-91, self-lubricating fibre graphite for machinery bearings, Cooper, v 13-92; friction of, Thurston *Cassier's* Oct-92; J. V. Wilson *Eng* \* Apr 20-88; anti-friction materials, Hedges, Aug 26-92; dry lubricants *E & Min* Aug 24-89; lubricating oil purifier *E News* \* June 21-90; the Holmes lubricant bearing, com. report *F Inst* Dec-91; measurement of durabil., Denton *Pwr* \* June; lub. oils exam., Stillman, Sep-90 *Steven's Indic*; durabil. of lubricants, Denton *R Gaz* May 23-90; rationale of, Snowden, Feb 13-91; Barr, Dec 2-92; lub. oils, Charlier *Sc Am Sup* Nov 29 *The Eng* Oct 17-90; oils, ed. Sep 18-91. See also BEARINGS without lubs; FRICTION and lub; GREASE; OILS

**Luiz**, Dom I (King of Portugal) *Inst C E* v 100-90

**Lumber**, creosote, Fernandina works, Fla. *R Gaz* \* Nov 16-88; No. western traffic, Mar 25-92; cutting, circular saw or band, n *Sc Am Sup* \* Oct 25-90. See also WOOD

**Lunkenheimer**, Frederick, por. *Cassier's* \* Jan-92

**Lunn**, Robert W. *Inst C E* v 100-90

**Lyons**, John *Inst C E* v 101-90

**Machine**, moulding, Tabor *Am M E* \* v 13-92 *Cassier's* \* July; design, æsthetics in, Barr, Aug-92; design, Unwin, bk. review *Eng* Apr 24-91; designing, intuition in, Hawkins *E Mag* July-92, do. *The Eng* Feb 15, 22-89; designing, Sweet *F Inst* \* Apr, do. *R Gaz* \* June 15, do. *Sc Am Sup* \* Apr 28 \* May 5-88; accident preventing devices, Cooper *Pwr* \* Dec-90 *Am M E* v 12-91; construction, Richards, bk. review *R & Eng* Nov-89

**SHOPS**, Austrian regulations for *E News* May 81; slow burning construct., Boston Manuf's Mut. Fire Ins. Co. \* July 26-90; with weaving shed roof, Sweet \* Dec 15 *Am M E* \* v 13-92; France *R Gaz* May 2; framing, Wilmerding, Pa., Westinghouse \* Apr 11, June 6-90; Link Belt Machine Co. \* Apr 24-91

**STOKING**, Spencer, discuss., insets *Inst C E* \* v 104-91. See also STOKERS, mechan.

**TOOLS**, mod., Dixon *Eng* Feb 3 *The Eng* Jan 20-88; power used by, n *E News* July 19-90; indic. diag. from, Breckenridge *Lehigh Eng J* Oct-88. See also Shipyard machine tools, etc.



**Machinery**, The Mechanics of, Kennedy, bk; tight set-screws in, Cooper, discuss. *Am M E* -88; miscel., Roy. Agric. Show, Nottingham *The Eng* July 20; use of in construction, Price, Oct 26; sale of old, Sharp, Stewart & Co. 26-88; old, sale prices, July 19-89

**Machines**, accident preventing devices applied to, Cooper *Am M E* v 12 -91 *Pwr* \* Dec -90. See also AUTOMATIC—SLOT machines

**Mackensie**, John *Inst C E* v 106 -91

**Mackintosh**, Alexander *Inst C E* v 101 -90

**Macnab**, Alexander *Inst C E* v 104 -91

**Macy**, Arthur, por. *E & Min* \* May 9-91

**Magheramorne**, Lord *Inst C E* v 101 -90

**Magic** lantern, optical projection, Wright, bk. review *Eng* Dec 4 *The Eng* \* Nov 18 \* Dec 25-91

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**Magnetic**, circuits and measurements, Du Bois *El Rev Lond* \* Oct 9; induction, molecular proc. in, Ewing (full) *Sc Am Sup* \* Nov 14; reluctance, Kennelly (full) *El Wild* \* Nov 7, discuss. 21, (full) *El Rev* \* Nov 7-91; fields, graphic representations, Houston \* Sep 3-92. See also ELEC. magnetic

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LOVETT-Finney iron ore *E & Min* \* Nov 21-91

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**Magnolia** metal for machine bearings, R. H. Smith report *The Eng* \* Dec 20-89

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**Malaria**, malarious districts, treatment of *Eng* \* Mar 2-88; Celli *Sc Am Sup* \* June 27-91

**Malt** drying vac. stove *Sc Am Sup* \* June 30-88

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**Manufactures**, time and cost keeping, Binsse *Am M E* v 9 -88; manuf'g industries net profits, ed. *Eng* Oct 9; practical prime cost, ed. Dec 4, 11-91; in U. S., growth, n *E News* Oct 11; industries stats., ed. *E & Min* Aug 2-90; and arts, review of prog. *F Inst* Feb -88; English manuf's in U. S., Siddell *The Eng* Nov 14, 21-90; Am., recent growth, Nov 25-92. See also INDUSTRIAL Co's

**Maps**, in relief, construct., Harden *Am Min* \* v 16-88; mercator chart drawing on one sheet, Kelvin *El Rev Lond* \* Sep 30-92; of ordnance survey, Scot. Highlands *Eng* Jan 6, 20 \* Feb 3, 17 \* Mar 2, 16, 30 \* Apr 13, 27 \* May \* June 1, 15, 29-88; pocket mapping instrum., Lane *E & Min* \* Apr 12-90

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CARSON, the, n *R & Eng* \* May -91

CALORIC str., compound *Eng* \* Aug 23-89

CITY of Dundee str., inset *The Eng* \* Feb 26-92

EDGAR, H. M. S. *Eng* \* Jan 1-92

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- AUSTRALIA and Galatea valve gear diag. *The Eng* \* Mar 29-89
- AUXILIARY, on shipboard, W. Allen *Eng* Jan 16, discuss., inset *Inst C E* \* v 104 -91; str. Violet, inset *The Eng* \* Aug 7-91
- BALANCING and vibrations of vessels *Eng* \* Apr 8, inset \* 15 *E News* \* Apr 28, (full) *R & Eng* \* Aug *Sc Am Sup* \* June 4, (full) *The Eng* \* Apr 8-92
- BARHAM and Bellona str., insets *Eng* \* Nov 28 \* Dec 12, 12-90
- BUENOS Ayres str., quadруп-expan., insets *Eng* \* Oct 12, 26-88
- CANFIELD's compound *R & Eng* \* Aug -91
- CERAM, Dutch gun-boat *R & Eng* \* Mar -88
- CIRCE str., trip-expan. *The Eng* May 11, 11-88
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- FURST Bismarck str., insets *Eng* \* Apr 1, 22-92
- GOVERNORS, Churchill *Eng* Jan 17 *Sc Am Sup* Feb 22-90
- GRACE Darling steam yacht *The Eng* Mar 23, 23-88
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- KAISER Wilhelm II str., insets *Eng* \* Aug 1, 15-90
- LADY Torfrida steam yacht, trip-expan., inset *Eng* \* May 10-89
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RE Umberto, 20,000 h.p. compound, Ital. twin-screw war str. *The Eng* July 6-88

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**Matter**, radiant, Crookes *Eng* Jan 23-91; molecular structure of, Anderson *Sc Am Sup* Nov 16, 23-89

**Maxwell**, William H. *Inst C E* v 91 -88

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**McAlpine**, William J. (full) *Am C E* v 26 -92, por. *E & Min* \* Mar 15, por. *E News* \* Mar 8 *Inst C E* v 100 -90

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- Measure**, foot, old Japanese, Lyman *E News* \* July 18-91. See also WEIGHTS and measures
- Measuring**, new planimeter, H. Shaw *E News* \* Oct 13-88. See also INSTRUMENTS; SURVEYING, etc.
- Measurements**, refinements of mod., Brashear (full) *Sc Am Sup* Apr 5-90
- Meat** 'preservaline,' Terne *F Inst* Nov *Sc Am Sup* Nov 7-91
- Mechanical** engineering, mechanics of eng., Weisbach, bk. review *E & Min* Jan 31-91; mechan. prog., Price *F Inst* Oct -89. See ENGINEERING mechanical
- Mechanical** Movements, The Engineer's Sketch-book of, Barber, bk., Span, Lond. '89, review n *E & Min* Apr 11-91
- POWER, 'overhauling' of a, Webb *Am M E* v 10 -89
- SCIENCE, Anderson, addr. *Eng* Sep 20, 27-89, Noble, addr. Sep 12, 19-90
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**Muller**, Max, por. *Sc Am Sup* \* Oct 22-92



**Mummies**, Cal., W. Anderson *Sc Am Sup* Aug 25-88

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*E Rec* (Town) refuse destruction, Codrington report \* Sep 15, 22, Oct 13, 20, Dec 22-88; water supply for munic. purposes, Emery, July 4; (scope of work) Sep 19; notes abroad, Hering, Sep 26-91; St. Louis, Moore, Jan 23; Boston, 30, st. dept. report, Apr 23-92

*F Inst* sts. and pavements, Haupt, Dec -89; Am., French opinions, Le Rond *R & Eng* Nov -88 *An Ponts*; city refuse and garbage disposal, Foster *Sc Am Sup* \* Jan 23-92 *Eng*; munic. monopolies, Sinclair, state treatment of corp. property *Scribner's M* Nov *St R J* Oct -91. See also CITIES; PAVEMENTS; ROADS; SEWERS; STREETS; WATER-works, etc.

**Murton**, Frederick *Inst C E* v 96 -89

**Muscular** fatigue, Morso's ergograph and ponometer *Sc Am Sup* \* Nov 15-90

**Musgrave**, Joseph *Inst C E* v 104 -91

**Musical** instrums., construct. and capabilities, Hipkins (full) *Sc Am Sup* Sep 5-19, new keyed for just intonation \* Oct 17-91

**Nails** from tin-scrap, O. Smith *Eng* \* Oct 11 *Sc Am Sup* \* June 8 *Am Min* \* v 17 -89

**Nantes** port *Eng* July 19 \* 26 -89

**Naphtha** yacht Mignon, aluminum *Eng* \* Sep 9-92

**Nasymth**, James *Eng* May 9 *Locom* June, mechan. inventions of *The Eng* \* May 16, 23-90

**Natural** gas. See GAS, natural

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**Naval engineers**, ed. *Eng* June 17, training, July 8-**92**; insignia of officer's rank *Sc Am Sup* \* May 30-**91**; promotion (questions), Tracy Sep 10-**92**; *The Eng* Dec 19, 26-**90**; pay, Jan 30; in mercantile marine, Feb 13, cor. 13, Mar 6, Oct 2; for the naval reserve, 16-**91**

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*Eng* warships of the future, Albin, Aug 24-**88**, armor of, Barnaby, Apr 12, machin. of, ed. Aug 9; coaling the navy, July 19-**89**; warships of world, Aug 22; protection of ships, Barnaby, Dec 12-**90**; building, future policy, Brassy, Mar 20, 27; Armstrong builder \* July 31-**91**; electricity in, Hamilton, May 6; dimens. of warships, Wilmot, July 8; the Ward ram \* 15; electricity in, Deadman, 29, Aug 5-**92** *Inst M E*

*E Mag* warship building \* July; armored, limit of, Wins, Nov -**91**; new warships of world, n *E News* July 25; the mod. navy, ed. Sep 5; elec. lighting of, Hutchins \* Dec 5, 12-**91**; propelling machin. of mod., Wells, insets *Inst C E* \* v 91 -**88**; building, new programme, W. H. White, v 98, armor for, Barnaby, discuss. (full) \* v 98 -**89**; mod., Meigs *R & Eng* Apr -**89**; foreign warships, list \* Nov -**90**; war monitor Terror *Sci Am* Dec 1-**88**

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Dec 7-89; naval warfare, 1880-89, Clowes, Oct 18; the first monitor, n 25-90; Purdy's twin warship \* Feb 21; navies of world, relative strength, n May 2; armor plating, France and Great Brit. \* Oct 3-91

*The Eng* warships of the world, Lloyd's Register of Shipping, bk., Lond. '88, July 6-88, '92, bk. review, Aug 12-92; alternative designs for \* Mar 15, designs, W. H. White \* Apr 12-89; submarine mine str. \* Mar 28-90; mod. dims. of Eardley-Wilmot, July 15; power transmiss. and distrib. in, Soliani, 29, Sep 2, 9-92. See also STEAMERS; TORPEDO boats, etc.

ARGENTINE cruiser '25 de Mayo' *Eng* Nov 14-90; twin screw ar. clad ram Libertad, Nov 18 *The Eng* Nov 18-92

AUSTRIAN, Chilian, French, etc. warships *R & Eng* \* Apr -91

FRANCE, elec. lighting Marceau, Hutchins (full) *El Wild* \* Jan 23 -92; *Eng* June 6-20, Amiral Baudin \* July 4 \* Aug 15 \* Nov 14 \* Dec 12-90 \* Feb 20 \* July 24 \* Aug 7, inset 14, 28 \* Oct 9, 30 \* Dec 25-91; English and Russian *E News* June 23-88

*R & Eng* armored cruisers \* May -89, Charner ar. cruiser \* Aug -90; \* Apr; Le Tage warship \* July -91; and English, n \* Mar \* June \* Sep \* Oct -92; warship Forbin, unarmored cruiser *Sc Am Sup* \* July 26-90; ar. plating of, France and Great Brit. \* Oct 3-91; naval manœuvres *The Eng* July 25, Aug 1, 8; 20 years of naval construct. Oct 17, Nov 14-90; warships \* Aug 28-91

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*Eng* estimates, ed. Mar 14; Barraccouta accident, 14-28 \* Apr 18; naval manœuvres, White, Mar 28; stern-wheel gun boats \* May 16; navy additions in '90; Dec 19-90; estimates, ed. Feb 27, Mar 6; new warships, Brit. and foreign \* Feb 27 \* Mar 6: 2d class cruiser Thetis \* Oct 23; additions '91, Dec 18-91

*Eng* warships Edgar and Hawke \* Jan 1, inset 15; H. M. S. Grafton, Feb 5; Brit. experience with warships, White, Apr 15, 22; battle-ship Ramillies, inset \* Aug 12 \* Sep 30; cruisers Pique, Rainbow and Retribution \* Nov 4; H. M. S. Vulcan \* 18; additions, Dec 30-92



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*E News* English, French and Russian, June 23-88; the Ward ram for, June 1; warships design in England \* Aug 24-89; speed trials of, Capper, inset *Inst C E* \* v 95-89

*R & Eng* new, Apr; warship Nile, June; new fast cruiser *Magicienne* \* July -88; new \* June; warship Benbow, n \* Aug; battle-ship *Inflexible* \* Sep -89; armored cruiser *Imperieuse* \* Apr; battle-ship *Trafalgar* \* May; fast cruiser *Medusa* \* Nov -90

*Sc Am Sup* warship *Victoria* \* July 14, *Magicienne* and *Marathon* \* July 7-88, Benbow \* July 20, *Collingwood* \* Nov 9-89; cruiser *Blake*, trials \* Dec 12-91; H. M. S. *Vulcan* \* Nov 12; cruisers *Pique*, *Rainbow* and *Retribution* \* Dec 17-92

*The Eng* naval power, Symonds, Feb 10; armed cruisers, ed. July 13; belted cruiser *Australia*, Dec 7-88; str. *Victoria*, insets \* Feb 16, *Edinburgh* \* Apr 5, Benbow \* June 7, the *Inflexible* \* Aug 2, the *Collingwood* \* 4-89, *Imperieuse* \* Jan 31, 31, *Trafalgar* \* Feb 28, *Medusa* \* July 4; estimates, Mar 14; condition, Aug 1; naval manœuvres \* 29-90

*The Eng* warships *Royal Arthur* and *Royal Sovereign* \* Feb 20 \* Mar 6, *Victoria*, hist. and construct. \* May 1; at Chatham dockyard \* July 24; str. *Great Britain* \* Aug 28; ar. plating on, France and Great Brit. \* Sep 4; engineers for the naval reserve, Oct 16-91

*The Eng* navy estimates, Mar 11; H. M. S. *Royal Sovereign*, inset \* May 27; navy artificers, June 17; navy (list) July 1, 8; Capt. of the 'Mary Rose,' Clowes (full) \* July 29, Sep 16; *Vulcan*, inset \* Oct 7-92

ITALY, warship *Italia* *R & Eng* \* Apr, inset *Eng* \* Feb 17; iron-clad *Lepanto*, trials, *Soliani* \* Aug 24-88; fast cruiser *Piemonte* \* May 3, 31 *R & Eng* \* Aug, Watts *Sc Am Sup* \* June 1 *The Eng* \* Apr 26-89; warship *Re Umberto* *R & Eng* Dec -88 *The Eng*

JAPANESE cruiser *Chiyoda*, inset *Eng* \* Oct 10-90

RUSSIAN, English and French *E News* June 23-88, n *R & Eng* Sep -89

SPAIN, warships building *Eng* Sep 12-90; cruiser *Pelayo* \* Mar 20, *R & Eng* \* May -91

UNITED States of Am. *El Wld* elec. equip., Hutchins \* Jan 31 \* Feb 7-91; *Eng* design, W. John \* Mar 30; pneu. dynamite gun cruiser *Vesuvius* \* May 25-88, inset \* June 7-89; cruiser



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*E News* new protected cruiser, n Sep 20; battle-ship Texas, casting low pressure cyl. for \* Nov 29-90; battle-ships, stat. n May 30; cruiser 12, propelling machinery, inset \* Aug 15; navy of 1891, Dec 12-91; machinery of cruiser New York \* Jan 23-92

*R & Eng* warships, Jan - \* Mar, Texas, gunboat Yorktown \* June -88; elec. light installs. for, Veeder (full) \* Oct; English view of, Dec; naval prog. (very full) \* Sep-89 - Jan \* Mar - Aug \* Nov -91 \* Jan, n \* June - Sep-92; cruiser 12 \* Oct \* Dec -90; navy in time of peace, Barroll and report, Jan, Jan - \* May; dynam. cruiser Vesuvius trial, July -91 *Sci Am* Nov 8-88; Mar 23; gunboat Yorktown, Feb 2 *Sc Am Sup* \* Mar 2-89; designs, Biles, Apr 11; new gunboats Yorktown, Concord and Bennington, May 9-91; cruiser 12, the Columbia \* Oct 29-92

*The Eng* dynamite cruiser Vesuvius, notes, Mansel, July 5, Dec 27-89; proposed warships, ed. Jan 31, Philadelphia, trial report, Aug 8-90; twin-screw steel cruiser Charleston \* May 22; cruiser San Francisco \* June 19; cruiser 6, machinery, inset \* Oct 16 \* Nov 6, 6; navy, Oct 30-91; cruiser 12, the Columbia \* Aug 19; companion of propellers, Griffith, table, Oct 7; vessels, table, 21-92. See also U. S., prog.

**Navigation**, Atlantic, prog., ed. *Eng* June 20; inland, India, prog. of steam, Bolton, inset *Inst C E* \* v 99 -90; inland in Italy, Manara, abs. v 105 -91; first sextant *Locom* Oct -90; steam, history, H. Smith *Sc Am Sup* Aug 11-88; inland in France *The Eng* Oct 7-92

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**Neilson**, Walter M. *Inst C E* v 100 -90

**Newberry**, John S., por. *E & Min* Dec 17-92

**Newdigate**, Albert L. *Inst C E* v 92 -88

**New England pop. movements**, ed *E News* Oct 11-90

**New Jersey coast movements**, littoral, beach protection and jetty reaction, Haupt, discuss., insets (full) *Am C E* \* v 23 -90

**News**, the press as a newsgatherer, W. H. Smith *El Wild* Aug 8-91



**New So. Wales**, mineral resources, Wilkinson (full) *Sc Am Sup* Nov 14-91

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**New York city**, and Lond. traffic growth, Reckenzaun *El Rev Lond* May 24-89; making of a model, Foote *El Rev* Oct 3; rapid transit, Sprague. Mar 7, Sprague's solution *El Wld* sup. Feb 21, Mar 7, (full) May 30-91

*E Mag* rapid transit prob., Gribble \* May, n July -91; san. prog. in, Wingate, June; N. York's commercial blight (harbor property), Black \* June \* July -92; rapid transit *E & Min* \* Mar 23-89; future of, Kent, July 26, Aug 2-90; Rap. Tran. Commission report \* Oct 24-91

*E News* pass. movement diag. \* Feb 18; city value, ed. Mar 31; past and future of, pop., tables and stats., ed. Apr 22, growth \* May 5-19; Brooklyn and, relative residence areas, inset map, met. development, ed. Mar 17, 17, growth, ed. Nov 3 -88; the transit prob., cor. \* July 27, Commission probs. Aug 10; real estate, lot value, n Oct 26-89; rapid transit facilities, ed. Jan 4; death rate, 11; st. dept. Feb 1; subways at Broadway and Fulton sts., inset \* Nov 1-90

*E News* in 1890, n Jan 10; borings for rock along Broadway, diag. \* July 18; Rapid Transit Commission's report, diag. \* Oct 10, 17, plans, inset, ed. (full) \* 24, 24; pass. traffic, past and future of, ed. 31-91; rapid transit, Reno system \* Apr 2; rapid transit plans, Broadway franchise sale and specs., insets, ed. \* Nov 24, 24 \* Dec 1-92

*E Rec* proposed subway, Adams \* Aug 4-88 \* Feb 8; st. lighting, Love, Apr 5-90; st. cleaning, com. report, Mar 28; rapid transit prob. Oct 10, Steinway commission report \* 24, munic. ownership arguments, Prout, Nov 21, Croes, 28; scant water supply, Adams, cor. Nov 21-91

*R & Eng* pass. travel, n Feb -88; rapid transit, Nov -91; do., Cooper *R Gaz* Mar 20, Gribble, Apr 3, W. White \* 24, reports, ed. Oct 9, (full) \* 16, 23, 23, Nov 20-91; defence and attack, Bucknill *Sc Am Sup* \* July 7-88 *Eng*; rapid transit plans, Gribble *St R J* May -91. See also BRIDGES, Brooklyn; BUILDINGS; ELEC. wires, underground; MUNIC. eng; PAVING; RAILROADS. elevated; SEWERS; STREET railroads; WATER-works, etc.

**New York state survey**, final results of triangulation, bk., Weed. Parsons, Albany '87



**Niagara** Falls, life hist. of, Pohlman *Am Min* \* v 17-89; tunnel, Werner (full) *Cassier's* \* June; the motor for the World's Fair, Trowbridge *El Rev Lond* Feb 5-92; power util., Sellers *El Rev* Aug 29-91, Ganz \* Mar 19-92, scheme *El Wild* \* Feb 9, Hamilton plan, Watts, Mar 2, \* Aug 10-89; power plant \* Feb 6; transfer to Chic., two proposed methods, Perkins \* 20, \* Sep 24-92

*Eng* life hist. of \* Mar 22-89; util. \* Sep 26 \* Oct 17-31, Nov 7, 14-90 \* Jan 2, Feb 27, projects, Oct 23, Nov 3, 20-91, Ganz scheme, inset \* Feb 19; Power Co. 5,000 h.p. turbines, inset, ed. \* Dec 23-92; util., C. Sellers *E Mag* \* Sep *E Rec* Aug 8, 15 *F Inst* July *R & Eng* Aug *R Gas* July 17-91; retrocession of, Pohlman *E News* Dec 15-88; util., Herschel \* Jan 23; tunnel \* Dec 29-92; water vol., Bogart *E Rec* Mar 21-91; power plant \* Sep 24-92; util., inset (full) *Iron Age* \* Dec 8 *The Eng* Oct 14-92; Power Co. *Pwr* \* May -90, works *R Gas* \* Dec 23-92

**Nichols**, Edward L., por *El Wild* \* July 12-90

**Nickel**, ore, Russell Springs, Logan Cty., Kan., Dewey *Am Min* v 17 -89; and iron alloys, magnetic properties, Hopkinson *El Wild* \* Sep 6 *Eng* \* Sep 5; Sudbury mines, prov. Ontario \* Nov 21-90; and steel alloys, Riley, May 17-89; ore smelting plant for New Caledonia \* Mar 4-92

*E & Min* and cobalt, New Caledonia, Heard, Aug 11-88; and cop. deposits of Sudbury, Can., Bell, Mar 14; nickel-carbon oxide and applics., Mond, Sep 26-91; U. S. produc. '91, Ingalls, Jan 2; deposits of No. Car., Emmens, Apr 30; ores, New Caled., geol. and metallurgy of, Levat, July 9; anal., Emmens, Nov 26-92

*E News* nickel-steel, Am. Dec 13-90; metallurgy of, Levat, abs. *Inst C E* v 110 -92 *An Mines* v 1 -92; and uses, Donald *Pop Sci* Dec -92; and steel alloys, Riley (full) *Sc Am Sup* Aug 24-89; and iron, volatile compounds, Townsend, Apr 23-92; carbon oxide and applics., Mond, Oct 10 *The Eng* Aug 28-91

**Nickel-in-the-slot** machines, Aughinbaugh (full) *Sc Am Sup* \* Apr 11-91. See also SLOT machines

**Nicoll**, Donald *Inst C E* v 108 -92

**Nitrate** of soda, indus., Chili, n *E & Min* Feb 2-89, deposits and trade, do. Aug 9-90; Nichols's report, abs. Jan 17-91; deposits, Chfli, Walker report *E News* June 14-90; fields of Chili *Littell's* May 21-92. See also SODA nitrate



**North** Carolina, Western, geol. of Hiawassee val., notes on topog., inset map, Colton *Am Min* \* v 16 -88

**Notes**, memoranda, classification of *R & Eng* Sep -91. See also INDEXING

**Nova** Scotia minerals, geolog. relations, Gilpin *Am Min* v 18 -90

**Nozzles**, and diverging tubes, best form of, Nagle *Am M E* \* v 9 -88; flow of water through, expts. See FIRE streams.

**Numbers**, favorite, A. Williams *Sc Am Sup* \* Mar 16-89. See also ARITHMETIC

**Obesity**, physiological treatment of, Mendelson *Sc Am Sup* Apr 5-90

**Observations**, the average observer *R & Eng* Aug -91

**Ocean**, racing, ed *Eng* Aug 29, Bucknill, cor. n Sep 5, 5-90; temps. and submarine cables, Carpenter, Nov 9 *The Eng* Nov 16-88; Pacific, abysses of *E News* Aug 3-89; No. Atlantic pilot chart, map, Hayden *F Inst* \* Apr, June -88

**Office** organization and equip., E. D. Leavitt's, Cambridgeport, Mass. (full) *E Rec* \* Dec 3-92. See also ARCHITECT's offices

**Ogilvie**, Charles E. W. *Inst C E* v 103 -91

**Oil-cloth** waste util., Lance's method, com. report *F Inst* Oct -88

**Oil** engines, Knight's *The Eng* \* Aug 16-89; the Trusty \* Dec 4 -91. See also PETROL. engines.

**Oils**, ethereal, notes on *Sc Am Sup* Mar 31-88; maize, in pharmacy, Kennedy, Oct 19-89; essential, notes, Jan 11-90; and fats, notes, May 2-91; for light-houses and light-ships, Edwards (full) Mar 19-92; ap. for det. liability to spontan. combust., E. Richards *Tech Q* \* Dec -91; the Broxburn works *The Eng* Aug 31-88. See also GAS, oil-gas; GREASE; LUBRICATION; PETROLEUM

**ADULTERATIONS** detection by Abbe's refractometer, Duffield *Sc Am Sup* \* June 1-89

**COTTON-seed**, indus., E. Thompson *E Mag* \* Sep -92; indus. applics., Grimshaw *F Inst* Mar -89; Thornton *Sc Am Sup* May 26-88; Tompkins (very full) Nov 28-91. See also COTTON-seed oil

**CYLINDER** *Sc Am Sup* Jan 16-92 *Chem Tr J*

**FIELDS**, the Florence, Col., Eldredge *Am Min* \* v 20 -92; So. Am. *Eng* Oct 14 \* 28-92; Col., Newberry *E & Min* Dec 15 -88; of Barren Cty., Ky., Fischer \* Feb 15-90; Wyoming, Rigge report *Sc Am Sup* June 28-88. See also PETROLEUM



- Oils**, FUEL, liquid, Francisco *Sc Am Sup* Apr 6-89. See also  
 BOILERS — LOCOMS., fuel; FUEL, liquid  
 KEROSENE, commercial, safety of, Newbury *Sc Am Sup* Nov 10-88 *Am Chem J*  
 LINSEED, Duff *Sc Am Sup* Feb 25-88; boiled, expts. on prep. of, Thorp, July 5 *Tech Q* Feb -90  
 LUBRICATING, exam., Stillman *Pwr* Sep -90 *Steven's Indic*; rapid method of det. compos. of, Gupper *Sc Am Sup* Apr 9-92 *Chem News*. See also LUBRICATION  
 MIXING plant, Lehigh Val. R., Coleman (full) *R Gas* \* Apr 10-24-91  
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 PARAFFIN, manuf., Stewart (full) *Sci Am Sup* May 4-89  
 PUMPING and engine data *E Rec* \* July 4-18-91  
 STANDARD Oil Trust's agreement (full) *E & Min* Mar 3-88; ten years of, Dodd *Forum* May -92  
 TESTING machine, East. R., France *Eng* \* Mar 14, 28-90  
**Oklahoma**, new territory *E News* Apr 20-89  
**Okonite** *El Rev Lond* June 8-88. See also ELEC. insul., okonite  
**Oldham**, James *Inst C E* v 103 -91  
**Oleomargarine** manuf. *E & Min* Mar 2-89; Caldwell (full) *F Inst* Sep *Sc Am Sup* Dec 10-92; Babcock (full) July 5-90  
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**Ore** *Am Min* Blake crushing system and results; deposits, structural relations, Emmons (full); magnetite concn. with Conkling jig at Lyon mt., N. Y., Ruttman; and matte-roasting in Utah, Terhune \* v 16, 16-88  
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*E & Min* ore sorting, Bartlett \* Apr 14; deposits of Red mt. mining dist., Col., Kedzie \* Aug 11-88; metallur. experience, Ontario mine, Utah, Janin, Jan 18; anal scheme for smelting



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Dougherty, Feb 8; deposits, isochemic lines in, Browne \* Apr 19; deposits and mines of Minas Geraes, Brazil, Mezger, Raymond, Aug 30, Sep 6-90; deposits of Pioche, Nev. Feb 7; supply for Vir. furnaces, Pechin, Mar 14, 21, cor. 28-91

*E & Min* sampling at El Paso, Tex., Johnson, Jan 16, 23; deposits of Creede, Col., MacMechen \* Mar 12, Kuby \* 19; deposits of Newman hill, Rico, Col., Farish \* Aug 20-92; dressing in Germany *The Eng* Aug 15-29-90. See also COLORADO; COPPER; IRON; NOVA Scotia; SILVER; TIN ore, Can. — Col., etc.

**Organic**, anal. by combustion, W. Dudley *Sc Am Sup* \* Jan 12-89; forms, causes of variation in, Riley, Nov 17, 24, Dec 1, 8-88; chemistry reforms in nomen., Burns *Tech Q* \* Oct -92

**Organs**, elec., Swinburne *El Wld* \* July 4-91, do. Paris exhib., Hering *F Inst* June -90. See also ELEC. organs.

**Oscillating** engines, relative piston speeds, MacCord *Sc Am Sup* \* Oct 31-91

**Otto**, Nicolaus A. *Eng* Feb 6, por. \* Mar 20, por. *Sc Am Sup* \* Apr 18-91

**Oxygen**, extraction, Murray *Eng* Feb 7; cyls. testing \* Apr 11-90; atomic wt. Oct 7, ed. 28-92 *Compt r*; indus. extraction and use *E & Min* \* Mar 29-90; Parkinson proc. \* Apr 30-92; extraction from atmos. *E News* \* Apr 12-90; Kassner proc., abs. *Inst C E* v 105 -91 *Genie Civil* 8-91; manuf. mechan. appliances, Murray, insets (full) *Inst M E* \* Jan -90; indus. applcs., Thorne *Sc Am Sup* Apr 20, (full) June 1-89; active, in vital phenomena, Richardson, Feb 8-90; Parkinson's gas proc. \* June 11-92 *Iron*; liquefying, Dewar *The Eng* \* June 17-92. See also CHEMISTRY, oxygen

**Oyster** shells anal., L. P. Brown, n *Sc Am Sup* Mar 2-89 *Am Chem J*

**Ozokerite** (mineral wax), U. S. produc., Parker *E & Min* Aug 1-91; Utah, Seal *F Inst* Nov -90

**Ozone**, hist. synopsis, 1840-92 *El Rev Lond* Jan 22, Feb 12, Mar 18, Sep 16-92; Fahrigr *Sc Am Sup* Feb 28; formation by combust. and presence in air, Renouf, Apr 19, formation by elec. discharges \* 26; industrial elec. ozonization \* May 31-90; Fahrigr's electrostatic manuf. proc. \* Sep 24-92; *Chem Tr J*, *Am Chem J*



**Packing-presses**, hydr. (for cotton cloth), Hopkinson *Inst C E* \* v 90 -90

**Paddon**, William V. *Inst C E* v 103 -91

**Pagan**, John *Inst C E* v 96 -89

**Paine**, William H. *E News* Jan 10, por. *St R J* \* Feb -91

**Paint**, ore mines at Lehigh Gap, Hesse *Am Min* \* v 19 -91; fire-proof *E & Min* June 1-89; mineral paints, Kemp, Jan 2-92; *E News* Oct 12-89; C. B. Dudley (chem. applied to R's) *R & Eng* July-Sep; oils *Sc Am Sup* June 13-91 *Chem Tr J*. See also OILS. paint

**Paint mill** *Eng* \* Feb 10-88

**Palenque**, the Am. Pompeii *E & Min* Feb 22-90

**Panorama** of Transatlantic Co., Paris exhib. *Eng* \* July 5 -89

**Paper**, Paper-making, Text-bk. of, Cross, bk., Spon, Lond. '88; industry, Hobart *E Mag* \* Jan; newspaper making from wood, Hanford \* Sep -92; sulphite fibre or pure wood cellulose manuf., Michaelis *E News* June 29-89

*Inst C E* sizing with rosin, Wyatt \* v 91 -88; testing of, Haselkoos, abs. v 95 -89 \* *Zap Imp Russ* No 11-88; manuf. *Locom* Jan -89

*Sc Am Sup* Esparto (fibre), (full) Oct 5; pulp, iron mordants for toning and dyeing, Dec 7-89 *Chem Tr J*; det. of wood pulp in *Sc Am Sup* Apr 2; testing, Hertzberg report, Nov 5-92; manuf. and uses, Russell *Soc Arts Mass* -88. See also LIME sulphite fibre manuf; ROOFING paper (tar) manuf; SULPHITE pulp

**Paper bag machine**, Paris exhib. *Eng* \* May 31, rotary block-bottomed paper, Duerden, discuss., insets *Inst M E* \* Oct; Am. *Sc Am Sup* \* July 13-89; \* Feb 7-91

**Paris**, France, st. cleaning, n *E News* Jan 17, Aug 22; rapid transit, the Ladame plan, map \* 29; st. cleaning *Sc Am Sup* Sep 5-91; fires, see FIRE protection, also BUILDINGS; EXHIBITIONS; PAVEMENTS; RAILROADS; SEWERAGE; STREETS, WATER-works, etc.

**Park**, Prospect, Brooklyn, De Wolf, insets *E Mag* \* Apr -92; areas, n *Sci Am Arch Ed* July -88

**Parker**, Francis G. S. *Inst C E* v 100 -90

**Parker**, George C. *Inst C E* v 104 -91

**Parkes**, William *Inst C E* v 96 -89

**Pasley**, Charles (full) *Inst C E* v 103 -91



**Pasteur**, life work of a chemist, Roscoe (full) *Sc Am Sup* Dec 14 -89

**Pasteurizing** ap., Kuhn *Sc Am Sup* \* Oct 5-89

**Patents**, new and patented inventions, notes, Richards *Cassier's* \* Oct - Dec; influence on Am. industries, Mead, Dec -92; pat. law revision, Stewart (full) *El Eng* Jan, C. A. Brown, Feb; U. S. stats., Lockwood, Feb -88; a century of pat. laws, Blatchford, Apr 15-91

*El Rev* legislation, N. E. Elec. Light Assoc. discuss. Mar 10 -88; Am. system growth, diag. \* May 2; Brit. pat. and telegraph stats. June 27-91; law and what constitutes an invention, Lowrey (full) Mar 8 *El Wild* Mar 8-90; U. S. Commiss. report, Oct 5-89, Nov 1-90; Am. system, birth and growth, Mitchell, Apr 18-91

*Eng* interdependence of pats., ed. Mar 22-89, ed. May 2-90; centenary, Wash. June 5-91; German law, ed. Mar 4-92; see also files; 100 years of, Allison, pors. *E Mag* \* June -91; Am., limitation of by foreign pats. *E & Min* Feb 16-89

*E News* large decree for violation of, Tilghman glycerine pat. n Mar 31-88; business, n Dec 13-90; U. S. system, past and present, ed. Apr 18-91; claims, Starck *R & Eng* Jan -88; centenary of, ed. Apr, May -91; for small things (value of) *Sci Am* Nov 17-88; system, necessity for, Coale *Sc Am Sup* Mar 10-88; laws, a century of, U. S., Blatchford, May 9-91; French law *The Eng* Aug 2-89; English, value of, ed. Dec 25-91. See also ELEC. Co's, Edison incand. pats.—lamps—patents; *Eng* and *The Eng* files; INVENTIONS; LOCOMS., compound; U. S. pat. office, etc.

**Patten**, Francis J., por. *El Eng* Apr 2-90

**Patterns** marking system, Frith *Sc Am Sup* Sep 21-89

**Paulson**, Webster *Inst C E v* 91 -88

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*E Rec* and st. R's, Stayton, Dec 3-31-87, Jan 7, 21, Feb 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-88, Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-89, Jan 4-90; st., Colingwood, Mar 7; paving material, Butts, May 2, do., tests, table, Shedd, Sep 26-91; st., Haupt *F Inst* Dec -89, st., Sargent



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- Sc Am Sup* Jan 14-88; and paving materials *St R J* July -90, \* Oct -92. See also ASPHALT; MUNIC. eng; ROADS; STREETS and names of cities
- ASPHALT, *E News* Jan 21; in Berlin, Hering, Dec 15-88; rock asphalt, N. Y. Sep 28; on concrete, N. Y., Nov 16-89; in N. Y., Gilroy report, May 5-92; Lond. asphalt, cost of maintaining *E Rec* Jan 18-90; Wash., D. C., details (full) Feb 14; laying, Berlin, Germany \* Dec 19, 26-91, Jan 2-92. See also ASPHALT
- BERLIN, asphalt, Hering *E News* Dec 15-88; paving, Dec 13-90
- BOSTON, st. *E News* May 12-92, specs. *E Rec* July 25, Aug 1-91
- BRICK, and brick manuf., Calkins, insets *Am C E* \* v 26-92; st., Kent *E & Min* June 21-90; Billingsly *E News* Feb 2; Ryan, June 15, 29; Hale system of \* Aug 3; discuss. Dec 21-89; fire-brick, Culley, notes \* Mar 1, spec. 8; Nebraska City, spec. Mar 29; tests of, Potter, June 21; bricks and, Chase, July 19 \* 28-90; tests, Butts \* Apr 11-91; tests, table *E Rec* May 2-91; Burlington, Iowa, spec. Feb 27; fire-clay, Cleveland, O., specs. Apr 16-92; st., Sargent, abs. *Inst C E* v 91 -88 *J Assoc E Socs* -87; slag brick paving, Wright *Lehigh Eng J* Feb -89. See also BRICK
- DETROIT, report *E News* Mar 29-90
- DULUTH paving imp. and sewerage *E Rec* \* June 28-90
- GRANITE, for st. work, Cen. bull. *E Rec* May 16-91; granite block measuring, Jan 16-92
- HALE, the *E & Min* \* Jan 25-90; system of brick *E News* \* Aug 3-89
- IRON and oak combination, Cole *Am M E* \* v 13 -92
- KANSAS City, Mo. specs. *E Rec* Aug 29-91
- LIVERPOOL, England *E Rec* Dec 12-91
- NEW York city, Broadway, spec. *E Rec* Dec 12-91
- St. Louis, Mo., Mackland *E News* Mar 14; *E Rec* Feb 7-91
- STONE, noiseless, Nicolls *E News* Aug 2; slabs, Hudson river blue stone, Nov 29-90
- SYDNEY, New So. Wales, paved carriage-ways in, A. Mountain *Inst C E* \* v 93 -88
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- Pazzani**, Julius *Inst C E* v 95 -89
- Peach orchard**, a Conn., Hale (full) *Sc Am Sup* Sep 27, Oct 4-90
- Peacock**, Richard *Inst C E* v 97 -89
- Pearce**, Richard, por. *E & Min* \* Apr 4-91
- Pearce**, William *Eng* Dec 21 *The Eng* Dec 21-88
- Pearls**, chem. constitution, Harley *Sc Am Sup* Sep 15-88
- Pendulum** expts., Foucault's *Sc Am Sup* \* Jan 7-88
- Peninsular & Oriental Steam Nav. Co.**, ed. *The Eng* Dec 21-88
- Penny**, Alfred *Inst C E* v 101 -90, 107-92
- Pensions**, old age, ed. *Eng* Dec 18-91
- Percy**, John *Inst C E* v 99 -90
- Perfumes**, odors and sense of smell, Henry *Sc Am Sup* Oct 8-92 *Pop Sci*
- Perkins**, George L., por. *R Gaz* \* Aug 3-88
- Perkins**, Loftus *The Eng* May 1 *Inst C E* v 105 -91
- Perrier**, Roland *Inst C E* v 91 -88
- Perry**, John, por. *El Wild* \* July 11-91
- Personal** identification and description, Galton, abs. *Sc Am Sup* \* Aug 18-88
- Peru**, geol. of the Cerro de Pasco, and notes on topog., Hodges *Am Min* \* v 16 -88; Repub. of, Sears *NE Mag* \* Dec; commerce and resources, map, Pezet (full) *Sc Am Sup* \* May 7, 14; mining indus. Dec 24-92
- Peters**, Edward D., por. *E & Min* \* Nov 14-91
- Peto**, Samuel M. *Inst C E* v 99 -90
- Petroleum**, and natural gas in N. Y. state, Ashburner, inset maps (full) *Am Min* \* v 16 -88; crude as fuel for raising steam at So. Chic. works, Potter, coal vs. oil in puddling furnace, Billings, oil as a metallur. fuel, Felton, v 17, 17-89; Racine system of burning crude oil *El Wild* \* Apr 6-89; Russian transport., ed. *Eng* Jan 20 \* Feb 3-88; storage, Carrington, Apr 10; as the future fuel of the Pac. Coast, May 22-91
- E & Min* petrol. and its cognates, Hoefer, bk. review, Aug 4-88; market review '87, Jan 7-88, Jan 12-89, '89, Jan 4-90, Jan 3-91; origin, Hoefer, May 16; U. S. produc., Weeks, Cen. bull. June 20-91, '91 and market review, Jan 2-92; burning, Aerated Fuel Co's system *E News* \* Nov 30-89; oil fuel, Minneap. water-works, July 28-92; transport., U. S. *E Rec* July 26-90; Russian and Am., Sadtler, map *F Inst* \* May -88



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*Sc Am Sup* petrol. launch Zephyr \* Aug 18-88; (molec. structure of matter) Anderson, Nov 23-89; refining and lub. oils, n Aug 15; origin, Ross, Nov 21-91; solidification expts., Rideal, Mar 26-92; petrol. ships, ed. *The Eng* Oct 26-88; liquid fuel ap., Great East. R., Holden's system \* May 15-91; Root's launch motor \* Sep 30-92. See also FURNACES, liquid fuel; LOCOMOTIVES, boilers, fire-boxes; WELLS, petrol.

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PRIESTMAN'S *Eng* \* May 18 *E News* \* Nov 17-88, Sep 1-92; and Hornsby-Akroyd *The Eng* \* Sep 25-91

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Pettit, William *F Inst* Apr -89

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**Philadelphia**, map *Eng* \* Mar 9, 16-88; mayor's message, *Fitter E News* Oct 12-89; pub. works, Aug 2-90; st. cleaning '91, n Nov 10; as a seaport, Mahan *E Rec* Apr 23, 30 *F Inst* Mar, Apr; port of, Haupt, Jan -92. See also FIRE protection, Phila. fires; MUNIC. eng; PAVEMENTS; SEWERAGE; STREETS; WATER-works, etc.

Philbrick, Edward S. *E Rec* Feb 23-89

Phillips, Alfred *Inst C E* v 97 -89

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**Phonograph**, the new talking machines, Edison's, Hubert *Atlas* M Feb -89; graphophone, Tainter *El Rev Lond* \* Aug 3 *El Wld* May 19 (full) \* July 14; Gilliland \* May 19 *El Rev* \* May 19, Edison, June 16 *No Am Review* June -88; and micro-graphophone, Bleyer *El Rev* \* May 23-91

*El Wld* gramophone records, Houston, July 14, Berliner's \* Aug 18; some possible forms, O. Smith \* Sep 8, Hunter, n 22 -88; Bettini's micro-graphophone \* Apr 26-90; Edison's, ed. *Eng* Aug 17 \* Sep 14, 14-88; expt. \* Mar 15-89; phonos. and graphophones (full) *E & Min* \* Sep 15-88

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**Phosphates**, slag, Phillips *Am Min* v 17-89; commercial, list of, Adams, v 18-90; indus., n *E Mag* Aug *E News* July 18-91, of Fla., Wilson, insets *E Mag* \* Oct -92, do. beds, Ledoux *E & Min* Feb 8, notes, Wyatt, Aug 23-90; So. Car. phos. rock market '90, Jan 3; deposits, Fla., notes on geol. of, Darton, Feb 14, do. origin and deposition, Davidson, May 30; of Am., Wyatt, bk. review, Nov 14; Fla. fields, notes, Adams, 21, 28, Dec 5, 12-91, do. U. S. produc. '91, Jan 2; Fla., mining, do. \* 23 \* Feb 13, Pratt, Apr 2; So. Car., mining, Benedict \* Mar 26; beds of Maltese Islands, Cooke \* Aug 27-92

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**Photography**, of coal mine interior, Dewey, insets *Am Min* \* v 16 -88; applics. to sci. purposes, Wood *Eng* Mar 30; stereoscopic, Stroh \* May 4-88; prog., Abney, Oct 4-89

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tional relations, Himes, May; substitution of gelatine for collodion, com. report, Sep; lenses, focus of, Cheyney \* Nov -89 \* June; proc. without metallic salts, Dec -90

*F Inst* in the colors of nature, Ives, Jan; heliochromy, Prof. Lippmann's, do. Aug -91; *Locom* Sep -89; in natural colors, Feb -90; surfaces feebly sensitive to light, Osborne *Sci Am* Jan 19-89

*Sc Am Sup* platinotype proc., Gunther, Jan 21, Willis, May 12; gold and silver salts making, camera, Feb 4; plates, flex. substitutes for \* May 5, manuf. \* 26 \* June 9; stereoscopic \* 9; stellar, Holden, July 28; transferring and coloring, on glass, Ashman, Aug 4; negatives, Rau, 11; notes, Sep 8; instantaneous, Howland, Oct 6; notes, 6, 13, objectives, Bausch, Nov 3, 10, Dec 8; printing plates, Nov 17-88

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*Sc Am Sup* pictures distorting, Wallace, Mar 1; platinotype printing, Mar 1; composite, Batut \* Apr 5; a new photographic eye, Flammarion, May 3; ap., Lick observ., Holden \* Aug 16; image, Meldola, Sep 13; the Primuline printing proc. Dec 20 -90

*Sc Am Sup* tele-photog. (elec. transmiss. of pictures), Sutton \* Jan 24; in colors of nature, Ives \* Mar 14; in aniline colors, Green, May 2; aut., Enjalbert ap. \* 30; work of Herschel and Fox Talbot, Lang, Aug 15; postage stamp photos. \* 15; printing processes, Bothamley, 15; applics. of, Rayleigh \* 29; upon a black background \* Oct 24, 31; photographic chemistry, Meldola (full) Oct 24, 31, Nov 7; kite \* Nov 7-91

*Sc Am Sup* telescope lens, Dallmeyer \* Apr 9; notes \* May 7; composite heliochromy, Ives (full) July 2; photos. untrustworthiness \* Dec 17-92; of solar prominences, Hale *Tech Q* Nov -90

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**Photogrammetry** *Sc Am Sup* \* June 15-89

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**Photo-lithographic transfers**, Wilkinson *Sc Am Sup* May 11 -89

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**Photo-micrography**, imps. in, Zeiss ap. *E News* \* Jan 2-92; Pringle *Sc Am Sup* Oct 4-90

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**Physics**, Elements of (dynamics), Fessenden, bk., Macmillan, Lond. '92; precision of measurements, Holman, discuss. *Tech Q* Dec -87 \* May, (very full) *El Eng* Feb, May, July, Sep -88; law of inverse square, Wolcott, Nov -89; Physical Soc., flow in a strained elastic solid, C. Wilson *Eng* \* May 16-90; pendulum measurements *Locom* Jan -90; absolute zero, Aug -92

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**Physiology** of good and evil, Richardson *Sc Am Sup* Dec 14 -89

**Piercy**, Benjamin *Inst C E* v 96 -89



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*E News* and ditching plant, Om. & St. L. R., inset \* Aug 16 -90; formulas, Husten, cor. and ed. Aug 25; safe load for piles, ed. Nov 17; pile-driving experience, Howe cor. Dec 8-92

*E Rec* pile driver and adjustable derrick \* Nov 9-89, revolving hydr. \* Apr 4; driving, Adams, July 25; a pendulum pile driver \* Dec 5-91; driving, Jameson *R & Eng* Oct -89; triple row driver *The Eng* \* May 8-91

**Piles**, allowable load on, Haagsma, cor. *Eng* May 6; pile and trestle timber structures, Western Am. R's, inset \* 20-92; safe bearing load, formulas, Trautwine, cor. and ed. *E News* Dec 29-88, Jan 19-89; sinking, jet and screen dike, Missouri river com. \* Dec 6-90

*E Rec* pile bridges cost of repairs, Talbot Sep 20-90; abutments and piers, Jameson *R & Eng* \* Feb; preservation, Mc Intosh, June -90; safety of pile bridges *R Gaz* Apr 26-89, and trestle, Minneap. & St. Louis, Hixon, cor. \* Apr 17, deep water R., Halifax har. \* Dec 25-91; protection (cost), Pritchard *Sc Am Sup* Mar 1-90. See also BRIDGES; BUILDINGS; FOUNDATIONS; HARBOR eng; PIERS; TRESTLES

**Piling**, sheet, clamp for, Emery, inset *Am C E* \* v 20 -89; Wakefield's sheet *E News* Mar 1, Harris cor. \* 22-90



**Piles**, SCREW piles, in Germany *E News* \* May 26; for bridge piers, Spring \* Aug 4, cyl. pier sinking \* Sep 8-92

**Pill-picker machine** *The Eng* \* May 24-89

**Pilot** chart of No. Atlantic ocean, Hayden, map *F Inst* \* Apr \* June-88

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**Pittsburg**, stats., Ricketson *Am Min* v 19-91; *Eng* Oct 24-90

**Pivot** bearing (footstep), friction, expts., report *Eng* Mar 27 \* Apr 17-91

**Planimeter**, polar, novel applic., Emery, inset *Am C E* \* v 18-88; polar, Gieseler *Sc Am Sup* \* Mar 17; spherical, H. Shaw \* Nov 3-88

**Planing** machines, plate edge, Forth bridge works *Eng* \* Dec 14-88; Sellers', Paris exhib. \* Mar 14-90; double-acting tool rest *The Eng* Nov 9-88

**Plante**, Gaston, pors. *El Wld* \* June 22 *E & Min* \* 29 *Sc Am Sup* \* July 13-89

**Plants** evolution, Coulter *Sc Am Sup* \* June 16-88

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- Platinum**, electro-dep., Wahl *El Eng* July 16 *El Rev Lond* July 11 *El Wld* June 28 *F Inst* July, (full) *Sc Am Sup* Nov 22 *E & Min* June 21-90; metals (full) June 29-89; n Nov 29-90, Jan 3-91; *E News* Dec 20-90; and gold indus. of the Ural, Laurent, abs. *Inst C E* v 105 -91 *An Mines* v 18-90; *Sc Am Sup* Nov 23-89; prep. and es. of pure, Mylins, Oct 29-92
- Playing cards** manuf., Chilon (full) *Sc Am Sup* June 29-89
- Plumbing** *E Rec* \* Feb 4, 18 \* June 9, 16; N. J. law, July 7 \* 14, N. Y. specs. 21, Toronto, 28; Sep 1, 29, Nov 24-88; Boston Custom-house, May, June; Chic. regulations, Oct 26; N. Y. Cty. Court-house \* Dec 21-89; Turn Verein building, N. Y. \* Feb 8, 15; and drainage specs., N. Y. city, Apr 19, 20, May 3, 10; Boston law, June 21-90; St. Louis, Mo. inspection, Apr 4; Madison Sq. Garden, N. Y. \* 11; Birm., Ala., practice (rules) \* June 13; in 72d st. houses, N. Y. \* Nov 14-91; Chic. ordinance, Feb 13; Fifth Ave. theatre, N. Y. \* July-Sep; Suffolk Cty. Court-house \* Sep, Oct -92
- Pneumatic**, hoisting, Wheeler *Am Min* \* v 19 -91; dispatch, Wildemann system *Eng* \* Nov 13-91; tool, MacCoy's, com. report *F Inst* July -89; pumping ap. *Iron Age* \* Dec 8; dispatch improvements *Sc Am Sup* \* Feb 27-92 *Eng*; tubes, Postal telegraph system, Great Brit. *The Eng* \* Dec 18-91
- Pneumonia**, M. Smith *Sc Am Sup* Dec 1-88
- Pole** road locomotives *E News* Mar 2-89
- Police** signalling, Morgan's aut. elec. system, Hill *El Rev Lond* \* Mar 7-90
- Pollard**, Thomas S. *Inst C E* v 99 -90
- Polygons**, regular, graph. construct., Weihe *Lehigh Eng J* Feb -89
- Pompeian** house of Pansa, restoration *Sc Am Sup* \* Nov 8 -90
- Population**, the world's, n *Eng* p 458, Oct 16-91; finding the center of, n *E News* June 15-89. See also under names of countries, cities and places
- Porcelain**, manuf. in France *Eng* \* Jan 17, 24 \* Feb 7, 21 *Sc Am Sup* \* Mar 22, 29-90; English china, Bayley, abs. Apr 7; manuf. possibilities, Elbers *E & Min* Feb 25-88
- Portable** engines and boilers. See **BOILERS — ENGINES**, portable
- Porter**, John A. por. *E & Min* \* Sep 26-91
- Post**, penny, jubilee, ed. *Eng* May 23-90



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*R Gaz* frt. train, H. H. West'gh. Jan 27; gear for 6-wheel truck \* June 1, 8; quick acting, working instructions \* 15-88; rules, N. P. Mar 15; gear for box stock and ore cars \* Dec 20-89; recent imps., H. H. West'gh. Oct 10; and vac., trials in India, Nov 7-90; air, trials, Sep 16; imps. \* Nov 25-92; air, questions regarding use of *Sc Am Sup* Aug 1-91; goods train *The Eng* Mar 9-88; 60 carriage trains, expts. \* Oct 31-90

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- CAMDEN & Amboy, origin and early hist. *E News* Dec 12-91
- CANADA, ed. *Eng* Oct 16-91; and U. S. '87 *E News* June 16-88; stats. July 27-89; and No. E., early, map \* Aug 4; stats. n Sep 1-92; and canals *The Eng* Nov 9-88
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- CENTRAL Am. interoceanic, map *Eng* \* Aug 19, 26 \* Sep 16-92, *R Gaz* Jan 30-91. See also RAILROADS, Pan-Am.
- CENTRAL Pac. and Union Pac., driving last spike, Dillon *R Gaz* \* July 29 *Scribner's* \* Aug -92
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- CHICAGO R. terminal and harbor prob. *E News* June 9-92; do. Guthrie *R Gaz* Aug 8, Schmitt, Sep 26-90; exhib. imps. arrangements \* May 27, 27; prob., ed. July 8; six old, ed. Oct 7, 14; exhib. communication map *The Eng* \* July 22-92; Belt, proposed *R Gaz* \* Sep 9; Union Transfer, map *E News* \* Sep 8-92
- CHICAGO, Bur. & Q. report. report abs. *R Gaz* Mar 22-89, Apr 4-90, ed. Apr 8-92
- CHICAGO & No. West. report *R Gaz* Aug 2, ed. 9-89
- CHICAGO, Rock Is. & Pac. finan. condition *E News* June 30-88; report *R Gaz* July 12-89
- CHILI, projected *E News* Nov 10; No. & So. Am. Construct. Co., map \* Dec 8-88; Mar 9-89; Jan 18-90; Lockett *R Gaz* \* Nov 23-88; system, Conn (full) Oct 24-90
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- COMMISSIONS reports, Missouri, Me. *E News* Mar 31; Kansas, Apr 14-88; Me., Mass., R. I., N. Y. Aug 9-90. See also R's., Interstate Commiss.
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- CROSSINGS, of great rivers, location, Zdziarski *R & Eng* \* Aug - Nov -92; grade, abolition in Mass., ed. June 27, Mass. law, July 25-90
- BUFFALO grade, prob., Guthrie *R Gaz* \* May 6-92
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- COMPLICATED, Minn. & St. Louis *E News* \* Dec 28-89; N. Y., Prov. & B. \* Apr 26; Penn. R. \* Mar 15-90; Chic., Stewart ave. *R Gaz* \* Apr 24-91 \* Jan 29-92
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- GRADE, who should pay for the abolition of, Mass. R. Commiss. reports, ed. *E News* Aug 4-88; abolition in Mass., ed. *R Gaz* June 27, Mass. law, July 25-90. See also R's crossings, Buf. - Chic. - Worcester, etc.
- MASS. R. Commiss. report, ed. *E News* Feb 23-89
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- Railroads, ELECTRIC, CHICAGO** — St. Louis high speed, proposed *El Wld* \* Feb 20, Adams \* June 11-92
- CINCINNATI, Sprague system *Eng* \* Aug 8-90
- CONDUITS, Harding's closed *El Wld* \* Oct 11-90; Barkley *E News* \* Oct 20-92; Field *Sc Am Sup* \* Mar 14-91 *El Eng*. See also R's elec., Bentley — Brain's — Budapest — Love — Siemens, etc.
- DAFT, work on elevated roads and rap. tran. *El Eng* Aug *El Rev Lond* \* Aug 2, 9; test, Idell *Sc Am Sup* June 22-89 *Steven's Indic*
- DUBUQUE, Ia. Edco storage bat. motor, De Land *El Wld* \* July 25-91
- EDCO storage bat. st. car, Bates *El Eng* Oct 22 *El Rev* 25 *El Wld* 25 *St R J* Nov -90. See also R's elec., Dubuque
- EDISON's st. *El Eng* Nov 18-91
- EICKEMEYER-Field motor *El Eng* \* Dec 9-91
- FENDERS, West End, Boston, report *E News* Feb 21-91 \* Oct 27-92
- FLORENCE & Fiesole, Sherbner (full) *El Rev Lond* \* Sep 25, inset *Inst C E* \* v 106 -91
- FRANKFURT-Offenbach tramway, Krause *El Eng* \* June -88
- GEARING, epicylic, for cars and elevators, Aldrich *El Eng* \* June 22-92; wooden-toothed *El Wld* \* Aug 2-90. See also R's, elec., cars — motors
- GREAT Britain, tramways position in England *El Rev* Aug 8 *E News* July 18-91; United Kingdom, table *El Wld* Jan 25-90; and cable, McCallum *St R J* Oct -92
- HEATERS, the Carpenter-Nevis *El Eng* \* Dec 3; elec., Hanna *El Rev* \* Dec 6-90
- HAMBURG, Huber, inset *Inst C E* \* v 92 -88
- IRISH's system *The Eng* Apr 6-88
- LINEFF tramway system *El Eng* \* Oct 29, Kapp report *El Rev Lond* \* July 4, 25, Sep 19 *El Wld* \* Oct 4; undergr. system *St R J* \* Nov; magnetic *The Eng* \* Aug 15-90
- LIVERPOOL elevated *Eng, The Eng* \* Aug 15-90
- LONDON, City & So. Lond. subway *El Rev Lond* \* Nov 7-90, Grindle, July 29, Aug 12, Sep 18-92 *El Wld* \* Nov 29-90 *R & Eng* \* Jan -91
- LOVE conduit system *R Gaz* \* Sep 9-92
- LOWELL, Mass. plant *Pwr* \* Dec -91



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**Railroads, ELECTRIC, LYNN, Mass., profile** *El Rev* \* Dec 8 -88

MOTORS, st., Manhattan elevated and st. locom., compar. tests, Moss, discuss., insets *Am C E* \* v 28 -90; total eff. and power required to drive car, Bonnett, v 27 -92; Eickemeyer-Field *El Eng* \* Dec 9; formulas, Reid, 23-91; elec. control of, methods, Parshall \* Apr 27 *El Rev* \* 80, discuss. (full) May 14 *El Wild* \* Apr 30 \* May 14 *St R J* May; tests at Minneap., Shepardson (full) \* July 9 *El Rev* \* 16, (full) *El Eng* 18; st. car, testing, Hutchinson \* Aug 31; Rae, equip. \* Nov 30; Sprague, test *El Rev Lond* 11-92

*El Rev* Sprague, magnetic data, Parshall \* May 31 *El Wild* \* 31; the Wenstrom \* Sep 27-90; the Palmer \* Nov 28-91; Bentley-Knight standard *El Wild* \* Jan 12 \* May 4; Sprague st. Dec 14-89; in R. work, Bell *R Gaz* Mar 21-90, eds. Apr 17, 24-91, (full) *El Wild* Mar 22; wooden-toothed gearing \* Aug 2-90; Short's gearless, Higgins (full) *St R J* \* June -91 \* May *El Wild* op. (full) \* Apr 16; bucking of st. motors, Shepardson \* Sep 10-92; new departure in construct., Leonard *E News* Nov 28-91; Sears, ed. comments *R Gaz* Nov 18-92

*St R J* prob., Mailloux \* Feb -90; Patton, n \* Oct -91; single, for cars, Sperry \* Apr; and dynamos manuf., T. H. Elec. Co., Lynn \* Aug \* Sep -92

NEVERSINK mt., test, Hering, Aldrich (very full) *El Wild* \* May 28 - July 30-92

NEW YORK, Fulton st., Bentley-Knight (undergr. wire) *E Rec* \* Apr 6, n *The Eng* \* Feb 1-89

PARIS, Julien-Tournier-Broca *E News* \* Aug 11-88

PITTSBURG *E News* June 30-88

POLE, the Milliken *E News* \* May 3; Phoenix iron col. *R Gaz* \* May 2-90

POWER stations, Mailloux's system of power equalizing *El Eng* \* Dec 3-90; Church, n \* Apr 27, points \* June 29; Mailloux, Aug 31-92; tests, Hale *El Rev Lond* \* May 30 *El Wild* \* 17-90; high and low speed engines, compar. test, Wason, Mar 19, Apr 30; importance, Roberts, Oct 22; ideal, Field, Dec 31, etc. -92; Mackie *El Rev* July 23, 30, Aug -92; (steam) plant, Field *Pwr* \* Oct -91; Church \* June -92; *St R J* \* July -91; Field, Cook \* Feb, Bickford \* Mar \* June \* Sep \* Oct -92



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**Railroads, ELECTRIC, BIDDEFORD and Saco, Shaw** *El Eng* \* Nov 28-92

BOSTON, West End, Shaw (full) *El Eng* \* Oct 21-91, n *El Wld* \* Jan 18 *E Rec* \* Apr -90 *St R J* \* Dec -89 \* Jan -90 \* Sep -92

BROOKLYN City *St R J* \* Oct -92; Buffalo, Field *El Eng* \* Jan 28-91; Chic. City *St R J* \* Dec; Columbus, O. \* June -92; Indianap. *El Rev* \* July 5-90

KNOXVILLE, Tenn. *El Eng* \* Aug 6 *El Rev* \* 9 *Pwr* \* Aug -90; Lake Roland eleva. R., Balt., Abbott *El Eng* \* Dec 7-92; Little Rock, Ark. (full) *El Rev* \* Aug 20 *St R J* \* Sep -92

LOWELL, Mass., Shaw *El Eng* \* Jan 14-91; Lowell & Suburban, do. \* Oct 12-92; plant *Pwr* \* Dec -91; Newark, N. J. \* Jan -92; Pitts., Duquesne traction Co. *St R J* May -91; Topeka, Kan. rap. tran. *El Rev* \* May 25 *El Wld* \* 25-89; Utica, N. Y., test, Heilman, June 6-91

RAE system *El Eng* \* Oct 15-90

RICHMOND Union, inset (full) *St R J* \* June -88

RIVER & Rail storage car system *El Eng* \* Aug 6 *El Wld* \* July 26-90

St. Paul, Minneapolis, *St R J* \* Sep -91

SERIES Elec. Traction *El Rev Lond* \* Mar 15-89

SHORT series system *St R J* \* May -88, sup. \* Oct -92

SIEMENS & Halske's conduit *St R J* \* Dec -92

SISSACH-Gelterkinden, the (full) *El Wld* \* Nov 7-91

SNOW sweeper, Thomson-Houston *El Rev* \* Jan 9-92

SPRAGUE system *El Eng* \* Sep -89; vs. T. H. system, Hutchinson *El Wld* Nov 1-90; Boston *St R J* \* Jan -89

SOUTH Staffordshire tramways *El Rev Lond* \* Nov 18 *The Eng* \* 18-92

STORAGE bats., Direct Elec. Co's system *El Eng* \* May 13; in traction work, Pumpelly, July 9-90; Phil., Lehigh ave. \* Mar 25-91; in R. work, Macrae, June 29-92; traction, Bracken *El Rev Aug 24 St R J Sep El Wld* 17; Bell, Oct 5-89

*El Wld* (accums.) vs. direct cur. for traction, Hunter, May 12; Julien reg. switch \* July 21-88; and horses, compar. cost, Gadot, May 10, 24, 31, July 7-21; Chamberlain's rack \* Aug 9-90; (accum.) traction, Paris, n Apr 9-92

*E News* or accum. traction in England, June 14-90; present status, Salom, Sep 1 *F Inst Aug* -92; Dubuque bat., De Land,



**Railroads, ELECTRIC, STORAGE batteries**

abs. *Inst C E* v 106 -91 *El Wld* v 18 -91; applic., Hewins  
\* *Soc Arts Mass* -90

*St R J* Sprague system, Boston \* Jan -89; Fairchild \* May;  
Main's system \* July -90; mo. power, storage or primary, in-  
dependent system, Neftel, Nov -91; calcs. for, Huber, n *The*  
*Eng* May 4-88 *El Eng*. See also R's, elec., Edco—River  
& Rail, etc.; STORAGE bats.

SYRACUSE, N. Y., 3d ward, effc. test, Hulett *El Wld* \* Aug 16  
*St R J* \* Sep -90

THOMSON-Houston system (full) *El Eng* \* May -89, cost and  
prog. *E News* \* Nov 10, 24 *St R J* \* Dec -88; dynamos  
manuf., Lynn \* Aug \* Sep -92

TROLLEY guide, Galloupe's *El Rev* \* Jan 9-92

WALLER-Manville system *El Rev Lond* \* May 9 *Eng* \* 9  
-90

WEEMS' parcel elec. car, high speed work, Crosby (full) *El Rev*  
\* Mar 14-91; *E News* \* Sep 14-89

WENSTROM system *El Wld* \* Oct 25-90

WYNNE's urban system, report *El Wld* \* Mar 29 *E News* Apr  
5-90

ZIPERNOWSKI vertical rail tramway *El Rev Lond* \* Nov 15  
*El Wld* \* Dec 7-89

ELEVATED, elec. work on and rap. tran., Daft *El Eng* Aug *El*  
*Rev Lond* \* Aug 2, 9-89; Pruynway elec. *El Rev* \* Dec  
24-92; Riley elec. system *El Wld* \* Mar 16-89; Day sys-  
tem *E News* \* Dec 12; elec. mo. power on, W. N. Smith  
(full) *Sc Am Sup* \* Feb 21, 28 \* Mar 14; and incline plane.  
Fairchild *St R J* \* Feb \* Mar -91; Rap. Tran. Commiss. re-  
port to Mass. Legislature, Apr 5-92. See also CABLE R.,  
Los Angeles single-post viaduct; R's, incline—mt.

BERLIN Met. viaduct *E Rec* \* Feb 4, 11, 25 \* Mar 8-88

BOSTON (schemes) *E News* Apr 6-89; June 14-90

CHICAGO rap. tran. *Eng* \* Nov 20-91, high level *E News* \*  
May 11-89; Chic. & South Side Rap. Tran., inset \* Jan 16,  
terminal station \* May 5-92, stations *R Gaz* \* Apr 4, 11;  
Lake st. \* Mar 7-90; the 'Alley' and So. Side, inset \* Oct  
28 *Sc Am Sup* Nov 26-92

LAKE Roland, Balt., Md., Abbott *El Eng* \* Dec 7-92

LIVERPOOL *Eng* \* Dec 18, inset \* 25 *E News* Sep 5-91; Over-  
head *R Gaz* Oct 7-92; elec. *The Eng* \* Aug 15-90



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**Railroads**, ELEVATED, KANSAS City, Inter-state Rap. Tran., foundations for cols. *E News* \* Apr 21, May 12, 19-88

NEW York city, elec. work on and rap. tran., Daft (full) *El Rev* \* July 6 *El Wld* \* 6-89; business '92, report, n *Eng* Dec 23; coal consumption on, n *E News* Oct 5-89; capac. of increasing traffic of, ed. Jan 11-90; rap. tran., inset \* Dec 1-92; trains tonnage, Manhat. R. Co. *R Gas* Jan 3-90; Suburban rap. tran. \* July 24-91; legal cases, Wood, Jan 15, 22, Feb 5; Manhat. pass. traffic diag., Croes \* Dec 16, etc. -92

PENN. R., 4-track viaduct *E Rec* \* May 24-90; cost and saving, ed. *E News* Nov 24-88; Jersey City terminals viaduct *R Gas* \* Dec 12-90

QUAKER City, Phila. *R Gas* \* Dec 16-92

EMBANKMENTS, German, drainage of a *E News* \* May 10-90. See also EARTHWORK; R. construction — location

EMPLOYEES, wages in Indiana *E News* Feb 23-89; accidents to, in Great Brit., table, ed. Dec 20-90; employee's premiums, Ambrosovics *R & Eng* Nov -90

ENDLESS, Fender's (wheel ap.) *Sc Am Sup* \* Feb 11-88 *Industries*. See also R's, sidewalk

ENGINEERS, division and resident, ed. *E News* Jan 21-88

ENGLISH and Am. See R's, Great Brit. — U. S.

ENGINE houses, Berg *R Gas* Mar 11 \* 18-92

EQUIPMENT register and case, Harrington's *R & Eng* \* Dec -88

ERIE. See R's, N. Y., Lake Erie

EUROPE, notes from abroad, ed. cor. *E News* Aug 9; (length), table *R & Eng* Aug -90

FARES, zone system and Mass. *E News* \* Mar 12, do. (tariffs) Hungary, Acworth *Rev Gen Chem Fer* Apr, do. Austria, Aug 19th Cent Dec -92, and England, do. Sep -91, pass. tariffs, remarkable expt. *R Gas* Oct 25-89, Oct 2-91; pass., Austria, ed. May 23-90. See also RAILROADS, pass.

FENCES, Jameson *R & Eng* \* Feb -89

FLANGE scraper, the Nevins *E News* \* Sep 19-91

FOG signal, Drummond's *R Gas* \* Dec 6-89

FOREST supplies relation to, Kern *E News* Sep 15-88

FORMOSA, Is. Gov't. *Eng* \* Mar 25, May 6, 18 \* June 3 \* July 1; Matheson, abs. *Inst C E* \* v 109 -92

FORTH bridge, Scot., report *Eng* Jan 20, Apr 13-88; Oct 25-89; report, Mar 14-90; Hutchinson report *The Eng* Apr 13-88



- Railroads**, FRANCE, state ownership of, n *E News* Dec 20-90; notes \* July 11-91; consumption of ties on, Feb 20-92; traffic distrib. and cost price of transport., Recour, abs. *Inst CE* v 91, 98-88, 95-89 *An Ponts* \* v 14 -87, 15-88; in '88 *R Gaz* Apr 11-90; prog., Foy *The Eng* Dec 11-91, Jan 8; Northern France, profile between Paris and Amiens \* Dec 23-92
- FREIGHT**, effect of haul on cost of handling, Petri *E News* \* Mar 26-92; Hodge's universal frt. tariff *R Gaz* Sep 21-88; car service, equity of per diem and mileage plan, Yardley, cor. Mar 15, Wattson, cor. Apr 5; B. & M. frt. office, Worcester, July 19-89; car mileage decrease on home roads, Wattson, July 11; handling and distrib. on West Shore, do. Oct 10; class., English, 31-90
- FREIGHT** shed, iron, N. Y. Cen. *E Rec* \* Feb 22-90 *R Gaz* \* Mar 1-89
- FREIGHT** yards, Morrison *R Gaz* Mar 25 \* May 20, Appleton, June 10, Dearborn station, Chic. \* 24; Altoona, Penn. R. \* July 29-92
- FROGS**, the Parsons, Brooklyn br. n *R Gaz* \* Feb 21; spring rail, Mich. Cen. \* May 16; Campbell solid steel \* Aug 1-90; and switches, Ellis, May 29; frog angles det. by differential calculus, Haskell \* June 5-91; Vaughan spring rail \* Oct 7 *E News* \* 18-92
- GAUGES**, changing, abolition of broad on Great West., insets *Eng* \* June 8, 10, and in U. S. *E News* Aug 25; *R Gaz* \* June 10, and equip. for \* Nov 4, map *The Eng* \* May 13-27-92; of the world *E News* Dec 8 *R Gaz* Sep 14-88. See also R's, narrow gauge
- GAUTEMALA** Cen., narrow gauge *R Gaz* Aug 16-89
- GERMAN** *E News* June 2; n Oct 13; stats. '86-7 *R Gaz* May 25-88, '87-8, Oct 4; origin, methods, rates and class. Dec 27-89; stats. July 4-90; *The Eng* Jan 15-92
- GIEN** to Auxerre, consolidation of earthworks, Lethier, abs. *Inst CE* v 95 -89 *An Ponts* \* v 16 -88
- GLISSANT** (sliding), Paris and ed. *E News* \* Aug 31, Oct 26, 26-89
- GOVERNMENT** regulation of, Schoonmaker *R Gaz* Sep 11-91
- GRADES**, grade crossing question *E News* \* July 21-92; ruling gradient, Holbrook *R Gaz* \* July 27 *Sc Am Sup* \* 21 *Tech Q* May -88; h. p. to move 1 ton up various, table *St R J* Feb -90. See also R's, crossings, grade



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**Railroads**, GRAND Trunk, Can., prospects, Tyler addr. *E News* Nov 24, Dec 1-88. See also R's, Canada, G. T.

GRAVEL train unloading plant *E News* \* Apr 18-91

GREAT Britain, and tramway working, ed. *Eng* June 22-88; stats. \* Sep 26; prospects for '91, ed. Nov 28-90; and Prussian, ed. Mar 27; new trunk line scheme, May 15; ed. Sep 11; cost of working, ed. 18-91; colonial compared, June 10; a year's working of, ed. Sep 23-92

*E News* in '87, Oct 20; and Am. compared in op. expenses, Dorsey, table, Dec 8-88, Jan 11; saloon car, notes from abroad \* June 21; cars (comparisons), Ralph, Aug 30, notes, Nov 1-90; and Am., ed. July 4-91

*R Gas* working and management, Findley, Apr 6; ten years of, Oct 12-88; and locoms. June 21-89; cor. Feb 28-90; notes, Turner \* Dec 9-92; development of, McDermott (full) *Sc Am Sup* \* Nov 24; prog., ed. *The Eng* Oct 5-88; Findley, Aug 23; prog., ed. Sep 20-89; extent, ed. Sep 18-91. See also R's, Great No. - West. - London, etc.

GREAT Falls & Canada, n *E News* \* Oct 18-90

GREAT Northern, England, notes *E News* \* Feb 7-91; and No. E., profiles *The Eng* Nov 23-88; widening works, Lond. to Barnet \* July 22 \* Aug 5 \* Oct 7 \* Nov 4, 18, works, Doncaster, insets (very full) \* Dec 16-92

GREAT Southern & West. works, Inchicore *Eng* \* July 27-88

GREAT Western, England, widening *Eng* \* Apr 1; gauge changing \* June 3-92; notes *E News* \* Feb 21, 28 \* Mar 14-91; gauge changing and in U. S. Aug 25; broad g. abolition *R Gas* June 10; change of equip. for change of g. \* Nov 4; gauge conversion, map *The Eng* \* May 13-27-92

GREENOCK & Gourrock, Scot. *Eng* \* Feb 22, insets \* Mar 8-29 \* Apr 5-89

GUARDS, hours of employment, table *Eng* Feb 20-91

HAWAII, building in, Hau *E Mag* \* May -91

HIGHLAND, West, Scot. *Eng* \* Oct 3-90; map *The Eng* \* Aug 26-92

HISTORY, Liverpool & Manchester, Bailey *Eng* \* Feb 1; early, h. p. and sails on *E News* May 11-89; Camden & Amboy origin and early Dec 12; German studies of Am. *R Gas* Feb 13, 27, Mar 20 \* Apr 3, May 8-91; early R. travelling *Littell's* Jan 4-92

HOELLENTHAL, abs. *Inst C E* v 92 -88 *Dent Bauz* -87



**Railroads, HONDURAS** No. Coast *E News* June 16-88

HUDSON River Tunnel terminal, proposed *R Gaz* \* Aug 12-92  
 HUNGARIAN State, pass. tariffs, remarkable expt. *R Gaz* Oct 25-89; May 9-90. See also R's, pass. rates

HYDRAULIC, Girard's, Paris exhib. *Eng* \* Sep 27 *R & Eng* \*  
 Oct *Sc Am Sup* \* Sep 28, (full) \* Nov 2, ed. *The Eng* Sep 20,  
 n \* Oct 4-89 *Industries*

INCLINE plane, No. Hudson Cty. pass. elevators, Weehawken,  
 N. J., inset *E News* \* Jan 17-91; Lauterbrunnen-Muerren  
 cable \* Oct 20; Otis elevating cable, Catskill mts. \* Aug 18,  
 inset \* Sep 8 *R Gaz* \* Aug 12, 26 *St R J* \* Sep -92; hoists,  
 Arlberg *R. E Rec* \* Dec 27-90; Fairchild *St R J* \* Feb \*  
 Mar -91. See also R's, Dunderberg — elevated — mt. —  
 Rimutaka — Trincheras, etc.

ILLINOIS Central report, ed. *R Gaz* Mar 22-89

INDIAN, in '86, ed. *Eng* Jan 27; frontier \* Feb 10; ed. Sep 21-88; Mar 15, eds. Oct 4-89, Sep 19; extent, charges and cost,  
 Nov 28-90; ed. Nov 6-91; English practice and in colonies  
*E News* Aug 4-92

*Inst C E* Bengal & N. W., Rhind, insets \* v 91 -88; West  
 of, Portuguese, Sawyer, insets; broad and n. g. systems con-  
 trasted, Waring, discuss. (full) \* v 97, 97-89; concrete quarters,  
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 18-89, Nov 21-90; cheap service, ed. Dec 25-91; notes, Mar  
 4; provident funds on, Sep 28-92; *Sc Am Sup* Aug 24-89.  
 See also RAILROADS, Bengal

IRELAND *The Eng* Jan 15-92

INSPECTORS forms for reports, Buf., Roch. & Pitts. *E News* May  
 12-88

INTER-Continental (Mex. Cen. Am.), proposed, map *E News* \*  
 Sep 6 *R Gaz* \* Apr 18, *Sc Am Sup* \* May 10-90; \* Aug 14-91.  
 See also RAILROADS, Pan-Am.

INTERSTATE Commerce Commiss., U. S., 3d report *E News* Jan  
 11, 2d, ed. Aug 28, Sep 27, ed. Dec 13-90, report, Jan 16, 23, n  
 Dec 29-92; 2d report abs. *R Gaz* Dec 7-88, law amendments,  
 Mar 8, 8-89, report, Jan 10, stats. Aug 22, ed. 29, Dec 12-90;  
 Canada com. and its work, Schoonmaker (full) Oct 16-91;  
 stats. Jan 15-92. See also RAILROADS, U. S.

INTERSTATE Rap. Tran., cols. foundations *E News* \* Apr 21-88  
 ITALY, and steam tramways, Alden *E News* Sep 1-88



- Railroads**, JAPAN, map *Eng* \* Aug 9-89, ed. Mar 21-90; *R & Eng* Jan, Stein, Nov -88, map \* Sep, n Oct -89
- JERSEY City terminals, Penn. R., inset *E News* \* Sep 26-91
- KNOXVILLE So. Tenn., piece of difficult location *E News* \* May 9-91
- LA Guaira & Caracas, Heinké, abs. *Inst C E* v 110 -92
- LAKE Erie. See RAILROADS, N. Y., Lake Erie
- LAKE Shore & Mich. So., report and ed. *R Gaz* May 18-88, May 10-89
- LANARKSHIRE & Ayrshire *Eng* Sep 7-88, Tait *Inst C E* \* v 105 -91
- LANCASHIRE & Yorkshire, England, notes *E News* \* Mar 28-91
- LARTIGUE single line, in Kerry, n *Sc Am Sup* \* Apr 7-88
- LAW, need for uniformity in, diag., ed. *E News* \* Apr 9-92; recent and effects, Hadley *R Gaz* Dec 4-91. See also *R Gaz* files
- LEHIGH Valley, Jersey City frt. terminus, inset *R Gaz* \* Sep 4 -91
- LIBRARY, Prussian Dept. Pub. Works *R Gaz* Nov 8-89
- LIVERPOOL & Manchester, hist., Bailey *Eng* \* Feb 1-89
- LOCATION, with taper curves, Olmstead *E News* \* July 21, 28-88; general, with references to sources of traffic, Wellington, Aug 24, Oct 12, 26, Nov 2, field-work calcs. Nov 9, 16, 30, Dec 7, 28-89 \* Jan 4, 25, Feb 8; frog, Avery \* Mar 22-90; curved vs. tangent, Norfolk & West. \* Oct 5-89
- R & Eng* principles, Jameson (full) \* Jan-Dec -88 \* Jan -89; crossings of great rivers, Zdziarski \* Aug-Nov -92; field practice in west, Beahan *Sc Am Sup* June 23 / *Assoc E Soc*, *R Gaz* June 8; M'Elroy, July 6; theory, notes on, cor. Aug 3, 10-88; and construct. in No. W., notes, Russell, July 15-92. See also R's, curves
- LOGGING, engine for lumbermen, Teed *R & Eng* Mar -92; logging truck, Great No. R. *R Gaz* \* June 5-91
- LONDON, growth, ed. *Eng* June 1-88; City & So. Lond. deep tunnel, ed. \* Nov 7, 7 \* Dec 26-90; Central R. bill, Mar 6, 13-91; R's terminating in, ed. *E News* Sep 29-88; Met., notes \* May 2-91; traffic, Kemmann, bk. review *R Gaz* Nov 4; Waterloo terminus enlargement, Lond. & So. W. *The Eng* \* May 20-92. See also R's, underground, Lond.
- LONDON, Brighton & So. Coast, England, notes *E News* \* Mar 21-91



**Railroads**, LONDON & No. West., England, notes *E News* \* Apr 11-91; *R Gas* Oct 18-89

LONDON & So. West., England, notes *E News* \* Apr 18 \* June 18-91; widening and imp. works (Met. extension), Szlumper, insets *Inst C E* \* v 107 -92; Waterloo terminus enlargement *The Eng* \* May 20-92

LUXEMBOURG, map *The Eng* \* Mar 25-92

MANAGEMENT, English working and, Findley, bk. review Lond. '89 *The Eng* July 12, 28-89 *Eng* July 15-92; Am., Marlborough *E Mag* June -91; course of instruction in, C. F. Allen *R Gas* Nov 28 *Tech Q* Aug -90; Alexander *Scribner's* Jan -89; mismanagement (economics), Acworth 19th Cent Dec, bks. and articles on R. subjects *Economic J* June -92

MANCHESTER, Shef. & Lincoln., proposed extension to Lond. *Eng* May 1, 1, 22, cor. June 5-19; notes *E News* \* Apr 25-91

MAPS, survey, Low *E News* \* Jan 5-89. See also R's, U. S.

MARIETTA & No. Ga., map *E News* \* Sep 6-90

MASS. R. Commiss. reports, ed. *E News* Mar 23-89, Feb 21-91

MASTER Mechanics Assoc., Am., pro. *E News* June 22, 20-89, June 20, 27-91; *R Gas* June 22, 20-88, (full) June 21-89,

June 20, and ed. 27-90, (full) June 24-92, *The Eng* July 12-89

MEXICO, Parsons, insets *Am C E* \* v 22, and discuss., Schmidt, n v 23 -90; stat., map *E News* \* May 3, 3-90; ed. *R Gas* Nov 27-91; *Sc Am Sup* \* May 31-90

MEXICAN Cen. report *R Gas* May 16-90; fuel premiums, Aug 21-91

MIDLAND, England, notes *E News* \* May 9-91; profile *The Eng* Sep 20-89

MISSOURI Pacific report *R Gas* Mar 27-91

MOMBASA & Victoria N'Yanza, map *The Eng* \* Aug 19-92

MOUNTAIN, recent development of rack R's, Kuntze *E News* Apr 14-88; construct., Parsons, May 80; Van Zile's traction method for heavy grades \* Sep 8; cost of construct. and op., table, Dec 22-92

*Inst C E* bibliog. of papers on (foreign periodicals) and discuss. (full); Laon steep gradient, Brancher, abs; rack vs. adhesion, abs. v 98, 98 -89 *Genie Civil* \* v 13 -88; Eiger, n *R Gas* Aug 12-92; Agudio's system, Zanetti *St R J* \* Jan \* Feb; incline plane and elevated, Fairchild \* Feb -91; the Hasting's inclined cliff tramway *The Eng* \* July 24-91. See also ALPINE eng; R's, incline planes - mt., Abt



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- Railroads, MOUNTAIN, ABT** rack R's, on the Bolan R. *E News* June 16; in India, Sep 22-88; list of, in world, n June 7-90; in world, n Aug 27; Audra, abs. *Inst C E* v 105 -91 *Genie Civil* \* v 19 -91; system, n *R & Eng* Nov -88, Jan -89 \* Feb -90; list, n *R Gaz* Aug 14 *Sc Am Sup* \* Aug 15-91; Indian expts. with combined adhesion and rack rail *The Eng* July 13-88
- AUSTRIAN, combined adhesion and rack rail *E News* Feb 2 -89
- BRIENZ & Rothhorn rack, Preller, inset *Eng* \* Nov 11, 18 *E News* \* Dec 15-92
- BRUNIG, Switz. *E News* Dec 15-88
- BURGENSTOCK wire-rope, Lucerne lake, Switz., Sommerguth, abs. *Inst C E* v 100 -90 *Zeit deut Ing* -90; cable *R & Eng* Aug -90; first elec., n *The Eng* Sep 7-88
- DUNDERBERG gravity, Hudson Highlands, map *E News* \* Dec 21-89
- FLORENCE & Fiesole elec., Sherbner, inset *Inst C E* \* v 106-91
- GENEROSO, Lake Lugano, Switz., abs. *Inst C E* v 107 -92
- GUTCH, Lucerne, Switz., n *R & Eng* \* Sep -92
- HARTZ, cost of working, R. Wilson *Inst C E* \* v 96 -89 *The Eng* Mar 22-89
- HOELLENTAL rack, Baden *Eng* \* Jan 30, insets \* Feb 6, 27 \* Mar 13-91
- HONG Kong & Victoria Gap tramway *The Eng* \* Jan 23, 30, 30-91
- JUNGFRAU, Switz., projected, King *Eng* \* July 4, pneu. *E News* Mar 29 \* July 19 *R Gaz* July 18-90
- LAUTERBRUNNEN-Murren hydr. lift and elec. *The Eng* Oct 7 -92
- LOOKOUT mt. incline, Tenn., Adams *Am Min* \* v 16 -88 *Eng* \* Mar 30 *E News* \* Jan 7, abs. *Inst C E* v 92 -88 *Sc Am Sup* \* May 12-88
- MANITOU & Pike's Peak *Eng* \* Sep 4, Hastings, abs. *Inst C E* v 104 -91 *Sci Am* Jan 24-91; *E News* Dec 7-89; Abt rack rail system \* Apr 19 \* Oct 4; *R Gaz* \* Apr 4-90
- MATTERHORN, proposed *R Gaz* \* Sep 4-91
- MONTREUX, Switz. steep wire-rope, Territet-Glion, Strub, abs. *Inst C E* v 96 -89
- NEVERSINK mt., test, Hering, Aldrich (very full) *El Wild* \* May 28-July 30-92



**Railroads**, MOUNTAIN, PASADENA, So. Cal., Ellison *Cal Illus Mag* \* July -92

PHILA., Fairmount Park proposed gravity, map *E News* \* June 21-90

PILATUS, Switz. *Eng* \* Nov 1-89; Frank, abs. *Inst C E* v 92 -88; *R & Eng* Sep, Oct -89; friction brake *R Gas* \* Feb 18-91; n *Sc Am Sup* \* Aug 3-89

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SWISS rack R's *R Gas* \* Sep 16-92. See also names

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- NEW YORK, L. Erie & W., eds. *Eng* Dec 14-88, Feb 14-90; Jersey C. terminals interlocking plant *E News* \* May 23-91; report *R Gaz* Nov 29-89, ed. Dec 4-91, report, Dec 2-92
- NEW YORK Rap. Tran. elec. undergr., Sprague *El Eng* \* Mar 2, report, Apr 1, May 27-91
- NEW Zealand, n. g., working with light traffic, Maxwell *E News* Jan 9 *R & Eng* Mar -92, abs. *Inst C E* v 106 -91
- NICARAGUA, situation in, map *E News* \* Aug 29-91
- NOMENCLATURE (terms) in England and Am. *E News* Apr 13-89
- NORFOLK & West., Ohio extension, map *R Gaz* \* Oct 28-92
- NORTH British, England, notes *E News* \* June 27-91
- NORTHEASTERN, England, notes *E News* \* May 23-91
- NORTHERN Pacific, report *E News* Oct 25-90; the Stampede switchback, Cascade div., Huson *R Gaz* \* Feb 3-88; report, Oct 18-89
- NORTH London, England, notes *E News* \* May 16-91
- OLD Colony, report *R Gaz* Sep 19-90
- OREGON R. & Nav. Co's lease, ed. *R Gaz* Mar 9-88
- PACIFIC R. prob. in 1849, map, ed. *E News* \* Feb 16, 16-89; and the Gov't., ed. *R Gaz* Jan 27, Feb 3, Engr's report to U. S. Commiss. May 11-88; Cen. & Union, driving last spike, Dillon \* July 29 *Scribner's* \* Aug -92. See also R's, Cen. - No. - Union Pac.
- PAN-Am., Cen. Am. interoceanic, map *Eng* \* Aug 19, 26 \* Sep 16 -92; Conn *E Mag* \* Aug -91; *Goldthwaite's Geog. Mag* July -92; Inter-Continental (Mex. Cen. Am.) proposed, map *R Gaz* \* Apr 18-90; Jan 30; Conn, map \* May 29; Inter-Con. So. Am. \* Aug 14-91, map *Sc Am Sup* \* May 10-90. See also R's Inter-Continental, So. Am.
- PARIS, Met. *R & Eng* \* Jan -90; suburban, Moulineaux line \* July -89 *Genie Civil*
- PARIS, Lyons & Med. works *Eng* \* Aug 23-89
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*R Gas* study of zone tariffs, Mar 18; traffic in great cities, Croes \* Dec 16; transport. in European cities, consul. report *St R J* Feb, May -92; traffic, ed. *The Eng* Sep 26-90. See also RAILROADS, rates

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PLATFORM, Hollingsworth's revolving pat. *R & Eng* \* Aug -92; mul. speed, Schmidt & Silsbee's *R Gas* \* Sep 11-91. See also RAILROADS, continuous — sidewalk

PNEUMATIC, Judson system *E News* \* July 13-89; the Goebel \* Mar 22-90

PORTABLE. See R's, Decauville, Paris exhib. — Lartigue

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PROFIT sharing, Jenks *Charities Rev* May -92

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QUEENSLAND, Carrus to Herberton *R Gas* Dec 30-92

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-91

RICHMOND Terminal, ed. *R Gas* Mar 25-92

RIGHT of way, Hall *R Gas* May 8-91

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ROLLING stock, Brit. and Am., ed. *Eng* Oct 2-91; flex. wheel-  
bases, Twinberrow *Inst C E* \* v 98 -89; and track, N. E. R.  
Club discuss. *R Gas* Oct 18-89. See also CARS; TRACK

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St. Lazare terminus, chem de fer d L'Quest, Paris *The Eng* \*  
Nov 13-91

SANDING ap., rail, Bloxham *The Eng* May 18-88

SCOTLAND, prog. *Eng* July 11-90

SERVICE, elec. lighting in Leonard *E News* July 12-90

SHIP. See SHIP railroads

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Tacoma, U. Pac. \* Feb 20-92; design and construct., Bar-  
nett, Oct 19, 26, Nov 2-16-89, abs. *Inst C E* v 99 -90 \* *Can*  
*Soc C E* -89; Chic., St. P. & Kan C. *R Gas* \* Feb 10; N. E.  
R. Club discuss. and ed. on heating shops and mills \* Dec 21-  
88; Altoona truck, Penn. \* Apr 18-90; and yard, Denver,  
U. P. \* Apr 8-91. See also BUILDINGS

SIAM, n *R & Eng* \* Mar -91

SIBERIAN, ed. *E News* Oct 31 *Eng* 16-91; Trans-Sib., ed. Aug  
12-92; proposed, Cunningham, inset map *Inst C E* \* v 106  
-91; Sib. Pac., ed. *R & Eng* Dec -88; 1st section, Zdziar-  
ski (very full) \* June, 2d section \* Sep, world R's \* Nov, Nov \*  
Dec -90 \* Jan-Mar \* July, July -91; map *R Gas* \* July 10;  
Trans-Sib., map *The Eng* \* Dec 4-91

SIDEWALK, movable, Jackson park, Chic. *Eng* \* June 10 *E News*  
\* Feb 27; Hollingsworth's revolving platform pat. *R & Eng* \*  
Aug -92; Schmidt & Silsbee's mul-speed platform *R Gas* \*  
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**Railroads**, SIDINGS, proper lengths of turnouts for split switches, Byers *Lehigh Eng J* June -89; lap, Cleve. & Pitts. *R Gas* \* Dec 28-90. See also R's, switches

**SIGNALMEN**, hours of employment *Eng* Feb 13-91

**SIGNALS**, and signaling, Soule *El Eng* Jan -90 *R Gas* Dec 13-89; aut. signaling *El Rev Lond* \* Dec 30-92; ap. on locoms. *Eng* \* Nov 22-89; elec., Boston *E News* \* Oct 26; Soule, Dec 21, 28-89; Cen. R. of N. J. Mar 29; and signaling O'Donnell cor. Dec 20-90; fixed, uniform practice, com. report, Oct 20 *R Gas* 14-92; evolution of signaling, Koyl *F Inst* \* Jan -90; in Europe, Gossman *R & Eng* \* Dec -88 \* Jan - Apr -89, (full) *Rev Chemins*

*R Gas* aut., ed. June 15-88; Blodgett addrs. Sep 13; Soule \* Dec 13-89; dwarf, position, Sperry cor. \* Nov 28-90; imps., Blodgett *Soc Arts Mass* -91; insul. resist. of rail circuits, Mann *Tech Q* Apr -92. See also R's, switches — tunnel protection

**BALT. & O.** track standards *E News* \* Nov 7-91

**BLACK'S** aut. block *R Gas* \* Jan 24-90

**BLOCK**, Strom aut. elec. safety *El Eng* \* Aug 24-92; Nichols *El Rev* July 12-90; system solution, Leonard \* Oct 10 *E Mag* \* Oct *El Wld* \* 10-91; aut., elec. applics. \* Jan 9, 16, N. Y. Cen. \* 23-92; and interlocking in Great Brit. *E News* July 26-90; Prov. & Wor. system \* Jan 16; what it is, ed. Feb 6; standard rules, Haines, Oct 13-92

*R Gas* English practice, Farrer cor., ed. \* May 31, 31-89; Am. practice, May 2-16, June 6, Stewart, 20; Nichols, July 4; U. S. aut. \* Nov 7-90; Paine, Apr 24; Erie system \* Oct 9 -91; uniform rules for working, Haines, Oct 14-92. See also R's, signals, Black's — Hall's — Kinsman's — Sykes, etc. **BOSTON**, Rev. B. & Lynn, Boston interlocked yard, Nat. Sw. & Sig. Co. *R Gas* \* Aug 22-90

**CHICAGO**, Stewart ave. (complicated) crossings *R Gas* \* Apr 24-91 \* Jan 29-92

**CHICAGO** and switches, Mil. & St. P. *R Gas* \* Aug 3-88

**CLOCK**, Blodgett's elec. *R Gas* \* July 27-88

**COMPENSATORS**, n *R Gas* \* Mar 8-89; compensated distant, cor. Feb 28; Mitchell & Steven's wire \* Mar 7-90

**DOUGHERTY**, the, com. report *F Inst* Oct -88

**DRAW-bridge**, the Kelsey *R Gas* \* June 15-88; Thames river interlocking \* Feb 14; 3-lever machine \* Nov 7-90



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- Railroads**, SIGNALS, FRANCE, West. R., Paris exhib. *Eng* \* Aug 2, 9, Cen. R. Belgium \* Sep 18; No. R. elec. *R Gaz* Feb 21, Mar 7-90
- FITCHBURG R. aut. *R Gaz* \* June 15-88
- FOG, Drummond's *R Gaz* \* Dec 6-89
- HALL's aut. block system *E News* \* Sep 13, 20-90 \* Jan 24-91 *R Gaz* \* June 13 \* Sep 12, N. Y. Cen. \* Dec 5-90
- HAND and lamp *R Gaz* \* Nov 9, 9-88
- HARRINGTON's semaphore *E News* \* Mar 16-89
- HIGHWAY crossing, Street's *R Gaz* \* May 4-88; Hall's \* Mar 28; O'Neil's, n \* July 11-90
- HYDRAULIC, Paris exhib. *Eng* July 12-89
- JOHNSON's, N. Y. Cen. *R Gaz* \* Jan 15-92
- KELSEY gong *E News* \* Feb 28-91; distant and do. *R Gaz* \* June 27-90
- KINSMAN's block system *El Wld* \* Oct 1, and ed. *E News* \* Sep 29 *R Gaz* \* Sep 23-92
- KOYL's parabolic semaphore *F Inst* \* Jan \* Aug -89
- LAMPS *R Gaz* \* Nov 9-88; A. H. Johnson \* Oct 24-90 *Inst C E*
- LIVERPOOL, Lan. & York. Exchange station *The Eng* \* Aug 2-89
- LOCK-and-block, with aut. treadles *Eng* \* Nov 18; Lattig's lock *R Gaz* \* Dec 30-92
- LONG's elec. semaphore *E News* \* Dec 1 *R Gaz* \* Nov 30-88
- PNEUMATIC, West'gh. interlocking system *R Gaz* \* Dec 21-88; elec. selector for \* Nov 14-90
- ST. Gothard ap., Cox, abs. *Inst C E* v 95-89 *Zeit deut Ing* -88
- SEMAPHORE, the parabolic, Stockett *Lehigh Eng J* June -89; illum., Union Sw. & Sig. Co. *R Gaz* \* Mar 30; showing color at night \* Oct 19-88. See also R's, signals, Koyle's—Long's
- SIEMEN's elec. ap. *El Rev Lond* \* Apr 15-29-92
- SYKE's block ap., N. Y. Cen. *E News* \* Jan 23-92; *R Gaz* \* Oct 3-90
- TORPEDO-placing machine, aut., Nat. Sw. & Sig. Co. *E News* \* May 23-91
- TRAIN, tail lights, ed. *R Gaz* \* June 29-88; Grigg's elec. air \* June 7-89; Johnston elec., n \* Jan 31-90
- WATERLOO station, Land. & So. W. *Eng* \* May 27 \* June 24 \* Sep 16 \* Oct 28 *E News* \* June 23, inset *R Gaz* \* Dec 10 *The Eng* \* July 29-92



**Railroads**, SIGNALS, WEBB & Thompson's staff ap. *Eng* \* May 9 *E News* \* Mar 29, N. Y., N. Haven & H. *R Gaz* \* Aug 1-90

WISE's train staff system *E News* \* June 28-88

YARRINGTON's train order *R Gaz* \* Oct 24-90

SIMPLON, projected, map *E News* \* Nov 1-90

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SNOW excavs. and ploughs, rotary shovel *Eng* \* Apr 5-89; dimens., standard, N. Y. Cen. *E News* \* Nov 9; work of rotary, Aug 17-89; Russell concave, Intercol. R., inset \* July 12-90; snow on R's, Harkom \* Dec 29 *Can C E, R Gaz* Nov 18-92

*Eng* Jull's centrif. excav. \* Aug 30 *E News* \* Mar 30, Apr 27-89, work of, Feb 22-90, abs. *Inst C E* v 96-89 *R Gaz* \* Mar 29, cor. Sep 20-89, Feb 21, rotary, trials \* May 23, and Otis, cor. \* 30-90; ploughs, Denmark, Buron *Inst C E* v 91-88 *Rev Gen Chem* \* Aug-87; Judd's rotary steam, Miller *Lehigh Eng J* Apr-88

*R Gaz* the Nevens snow flanger, Maine Cen. \* Feb 3; Cox's \* Apr 6; rotary steam (full) \* 20; Leslie's rotary shovel \* Oct 12 \* Dec 15-88; ploughs, No. W. R. Club discuss. Jan 11; the Cyclone, Apr 26 \* May 10-89; the Russell \* Oct 23; rotary steam wheel shovel \* Dec 25-91; Gen. Elec. Co's snow sweeper *Sc Am Sup* \* Dec 31-92

SNOW sheds, Can. Pac. Keefer, insets *Am C E* \* v 19-88 *E & Min* \* Mar 2-89, Stoess *E News* \* Jan 21-88; protection from slides, Selkirk mts., Can., Cunningham, abs. *Inst C E* v 94-88 *Can Soc C E* 2-87, A. Frank *Zeit deut Ing*-88

SOUTH Australia *E News* Feb 7-91

SOUTH Eastern, England, notes *E News* July 4-91

SPAIN, practice. 20 years of *E News* Dec 13; Monte Generoso, abs. *Inst C E* v 101-90 *Schweiz Bauz*-89

SPEED, train, registering ap. *E News* \* Mar 5-92; Sabouret's measuring ap. n *Sc Am Sup* \* Aug 9-90

SPEEDS, train, express, ed. *Eng* Aug 23-89; past and future, ed. *E News* Nov 7-91; higher, McAlpine, Nov 17-92; fastest on record *Locom* Aug-88; Banderali *R & Eng* July-89



**Railroads, SPEEDS**

*R Gas* English and Am., ed. Feb 28, 28; inertia and vels. of at different speeds, table \* Oct 31-90; latest fast long dist., Phil. & R. and others \* Sep 18-91; highest recorded \* Mar 11; high, conditions affecting, McAlpine, Nov 18; 100 miles per hour, ed. (full) Mar 18, Forney *Scribner's* -92; practical limit of *Sci Am* Oct 20; table, n *The Eng* May 4-88. See also *LOCOMS.* trials, performance

GERMANY and continent *E News* Nov 2-89

GREAT Britain, West coast fast run, England, ed. *E News* Sep 15 *R Gas* Aug 10; notes, Aug 12, 19, Sep 2, 23-92; Edinb. fast *Sc Am Sup* Sep 29; fast, Great No. *The Eng* Mar 9; fast long dist. runs, a flight on the West coast, Aug 24, 24; the race to Edinburgh, profile Lond & N. W. Sep 14, Oct 12, Great No. and No. E. Nov 23-88

U. S., Am. fast, ed. *Eng* Sep 25-91; C. B. & Q. fast *E News* Dec 15-88; Phil. & R. Dec 8-92; Am., table, N. E. R. Club discuss. *R Gas* Sep 14, Oct 19-88; latest fast long dist., Phil. & R. \* Sep 18-91; fast, Empire State express, Apr 15-92; fast pass. *Sci Am* Sep 8-88; table *Sc Am Sup* July 27-89; Am. fast time *The Eng* Aug 31-88; table, June 21-89; high, ed. Oct 16, 23-91

SPIKES, track, and lag screws holding power, Cox, expts. *E Rec* Nov 14-91 *R Gas* Nov 27-92; \* Dec 27-89, Oct 3-90 \* Mar 6; adhesion of, Howard (full) \* May 1; the Greer \* Dec 11, test *E News* \* Mar 19-92; tripartite, Pat. Nut & Bolt Co. *The Eng* \* Aug 16-89

STATION indicator, the Allison *E News* \* Feb 14-91

STATIONS, elec. lighting *Eng* Dec 13-89; picturesque suburban, Gilbert *E Mag* \* Dec -91; small, standard plans, N. Y. Cen. *E News* Mar 31; suburban \* Aug 4, 25; Cen. R. of N. J. \* Oct 6 -88; minor structures, Can. Pac., inset \* May 24, 24-90; Macon & Birm. standard, inset \* May 26-92; and yards, design of, Parkinson \* Nov 29, inset *Inst C E* \* v 102 -90; Balt. & O., inset *E Rec* \* Dec 21-89; Mex. Nat. terminal proposed, inset *R Gas* \* May 9-90

BAY City, Mich. Cen. *E News* \* Dec 27 *R Gas* \* 26-90

BOSTON, Boston, Rev. B. & Lynn pass. *R Gas* \* Aug 1 -90

BRENTON, Plymouth & So. W. Junct. R., England *The Eng* \* May 30-90



- Railroads, STATIONS, CHICAGO**, Union Transfer *E News* \* Feb 8-90; and So. Side Rap. Tran. *R Gaz* \* Apr 11-90; exhib. terminal \* Sep 23; 12th st., Ill. Cen., inset \* Oct 14-92
- CÔLOGNE, Germany, trainshed *E News* \* Oct 6-92
- DETROIT, Mich., Fort st. union, inset *E News* \* Jan 31-91
- DULUTH Union, inset *E Rec* \* Jan 2, construct. \* Feb 6, 6 \* Mar 12-26 \* Apr 9, 23 \* May 21-92
- DUNDEE, Caled. R., insets *Eng* \* June 14, 28-89
- EDINBURGH, Princes st., Caled. R. *Eng* \* Sep 30-92
- FALL River, Mass. (Bowenville) Old Col. *R Gaz* \* Feb 27-91
- FORT Payne, Ala., pass., Ala. Great. So. *E News* \* Sep 12-91
- FRANKFORT-on-Main Cen., Germany, bk. review *E Rec* \* Jan 18-90, Union pass., insets (full) \* Sep 5-26 \* Dec 5-91, train shed erection \* Mar 5; arrangements, Wegele, abs. *Inst C E v* 110-92 *Zeit Bauwesen* -92. See also BUILDINGS
- INDIANAPOLIS Union *R Gaz* \* Jan 31-90
- JERSEY City train shed, Penn. R. *E News* \* Dec 27-90, inset *R Gaz* \* Oct 2-91
- LISBON, Pitsch, abs. *Inst C E v* 103-91 *Genie Civil* \* v 17-90
- LONDON, & So. West. suburban *R Gaz* \* Sep 19-90; St. Pancras frt., Midland R. \* July 6 *The Eng* Apr 6-88
- LOUISVILLE, Ky. terminal, L. & N. *E News* \* July 25-91
- MONTREAL terminals, Can. Pac. *E News* \* Mar 3, arches and retaining walls, 17 *E Rec* \* Jan 7 *R & Eng* Feb -88
- NEWARK, N. J., pass., Penn. R. *E News* \* Feb 14-91
- NEW York city, Harlem Depression R. overtrack, inset *E News* \* Feb 8, 15; Grand Cen. *R Gaz* \* May 16-90
- OMAHA, Neb., union, proposed *E News* \* Aug 17-89
- PARIS, France, St. Lazare terminus, chem. de fer d L'Ouest *Eng* \* July 12, 19-89 *The Eng* \* Nov 13-91
- PERTH, Scot *Eng* \* Aug 16-89
- PHILA., Broad st. terminal, Penn. R. *E News* \* Oct 6, 13 *R & Eng* \* Nov *R Gaz* \* Sep 30 \* Oct 21-92
- PITTSBURG, train shed, B. & O. *E News* \* Feb 23-89
- PORTLAND, Me., Union, inset *E Rec* \* Nov 30-89
- PROVIDENCE, R. I. terminals, the Cove *E News* \* Apr 27-89 \* Aug 2-90
- RYE, N. Y., N. Y., New Haven & H. *E Rec* \* Nov 23-89
- ST. Louis, Mo., Union pass., train shed *E News* \* Oct 3-91 \* Apr 2, insets 21, 28-92 *R Gaz* \* July 24-91
- SPRINGFIELD, Mass. pass., B. & A. *R Gaz* \* Mar 14-90



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- TRAIN dispatching, op. of, safety systems, ed.** *E News* Oct 12-89; graphic record, diag. \* Sep 5-91; duplicate order system *R Gas* Jan 10; Kinsman, July 4; Am. system, ed. 25-90
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*E News* in '90 and for five years, inset map, ed. \* Jan 3, 3, Aug 8; in '91, inset map \* Feb 28; states east of Chic., inset map \* Apr 11; in South, stats., inset map, ed. \* June 13, 13; and English, ed. July 4; No. West. construct., inset map \* Aug 1, 1; So. West. do., ed. \* Oct 3, 3; far West., inset map \* Nov 28-91

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*R Gas* construct. Jan -90 - Jan -91, table, ed. Jan 2, Jan - July -91, ed. June 26, 26; in '90, stats., Poor's Man. review, ed. Aug 7, 7; stats., census, ed. Nov 6; traffic and earnings, ten years' growth, ed. 13-91; construct. in '91, table, Jan 1, Poor's Man. review, ed. July 29, 29, Gov't. stats. and world's, Dec 16, 16-92; ten years' growth, ed. *The Eng* Nov 13-91; in '91, Oct 28-92. See also R's, Interstate Commerce Commission reports VICTORIA, New So. Wales *Eng* Nov 14, 28-90, Jan 30 \* Mar 6 Apr 10-91

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*E News* German stats. Jan 12; manuf. cost in Penn. and England, comparative, Schoenhof, Consular report, Feb 9; portable saws \* Feb 23; hardness of inside and outside, compar. tests and ed. \* Apr 13, 13; and wheels, relations, Am. C. E. com. report \* June 22; consumption, Tratman, July 20; fastenings, Penn. R. \* May 11, Venezuelan R's \* Aug 3, Cox tie-plate \* Nov 28; conditions in manuf. which influence life of, Sep 21; and tires wear, N. E. R. Club pro. \* Oct 19-89

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*R Gaz* and chair, Lond., Br. & So. C. \* Feb 7; splice-bars specs., R. Hunt, Aug 15; recent \* Sep 26; the Clark-Fisher \* Oct 17-90; track joints, table, Ellis, Aug 28-91; French, Mussy \* Apr 1; Scaife, Oct 14; the Price \* 14-92

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QUEBEC Cen. 60-lb. standard *E News* \* Mar 19-**92**

SANDBERG's permanent way *Eng* July 26 *E News* \* Nov 9-**89**

SAVANNAH, Fla. & W. 70-lb. *R Gaz* \* May 17-**89**

SOUTH Australia Gov't. standard *E News* \* Oct 31-**91**

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*E News* in western arid regions, Greely report, Mar 16, 23-**89**; max. rates \* July 21; flow of streams and storage, diags. \* Oct 20; obs., Phila. *E Rec* Nov 5-**92**; artif. rain making, Houston *F Inst* Oct *Sc Am Sup* Oct 17-**91**; mean or av. and fluctuations, Binnie, discuss. (full) *Inst C E* \* v 109-**92**; rain formation, Blanford *Sc Am Sup* May 11, 18; and storms, Hazen, June 15-**89**; universal suction, Durozoi \* Nov 7-**91** *Genie Civil*; of the Globe, Tripp *The Eng* Mar 18-**92**



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**Ramie** plant, source of textile fibre *E News* Oct 5; Juvenet *F Inst* Nov *Sc Am Sup* Nov 23; fibre cleaning machinery \* May 25-**89**

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**Refractory materials**, Egleston *Sc Am Sup* Sep 27, Oct 4-90.  
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**Refrigerating**, aut. system, Denver, Col., Hanks, insets *Am C E* \* v 24 -91; 35-ton machine, ammonia-absorption type, performance, Denton *Am M E* \* v 10-89, 75-ton do. \* v 12 -91 *E & Min* \* May 16, 23-91; plant test, De V. Wood *Am M E* \* v 11 -90 *E News* \* June 28-90; results of performance of, Denton-Jacobus, July 7 *Am M E* \* v 13 -92

*Cassier's* mechan. refrigeration, Penney, \* Dec -91; La Vergne Co. \* Apr -92; Bate Co. decis. *El Wld* Feb 2-89; de la Vergne system, inset *Eng* \* June 15, 22-88; ammonia compression system \* Feb 8-89; machines, Richard, bk. review, Jan 9; tests \* July 31 \* Aug 28; and ice-making plant, Newcastle-on-Tyne \* Dec 4-91

*E News* Miller's ap. \* Jan 9; use of oil in ammonia gas compressors and effic., Strombeck, insets *F Inst* \* Apr -92; use of ammonia as refrig. agent, Lightfoot *Sc Am Sup* May 26 *The Eng* Oct 26-88; machines, Peabody *Tech Q* \* May -89; machine, Birkenhead *The Eng* Oct 5-88; Arktos cold air and freezing ap. \* Mar 8; Pontifex's machine, Sep 27-89; Linde system plant, 150-ton, Shadwell works, inset \* May 16, 30-90.  
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**Refuse**, disposal, house *Eng* May 15-91; Watson (full) Sep 16 \* 30, and ed. *E News* Oct 6, N. Y. city report, 27 \* Dec 1; cremators *E Rec* \* Oct 8-22, Nov 19-92. See also **CREMATORIES**; **MUNIC.** eng.

**Reid**, David *Inst C E* v 110 -92

**Rendering tanks** construct. *Locom* Feb -89

**Rennie**, William C. *Inst C E* v 105 -91

**Reproduction**, probs. of, Hartog *Contemp Rev* July -92

**Reservoirs**, storage, appropriation, ed. *E News* Oct 6-88; waste weir capac. det., McAlpine, June 29-89; U. S. and Can., embankments and dams, inset \* June 21-90; covered, Swan *R & Eng* Oct *J N E Water W Assoc*, *E Rec* Oct 13, 20 -88



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- E Rec* distrib., Curtis, June 20; water storage, Stearns, Oct 17; det. of capac., Fitz Gerald, 24; storage, Mass. State Bd. of Health report, Nov 14-91; use of asphaltum for linings, Schuyler, Dec 17-92 *Am C E*; res. dams, safety and service of, Kresnik, abs. *Inst C E* v 99 -90 \* *Woch Ost Ing* -89. See also DAMS; WATER-works, under names of places
- BOSTON, Mass., Waban Hill *E Rec* \* Aug 24, 31-89
- BUFFALO, N. Y., Prospect, new *E News* \* Jan 10-91
- COSHOCOTON, O. 320,000 gal. covered *E Rec* \* Aug 15-91
- EALING, Grand Junct. Co. storage *The Eng* Aug 24, 24-88
- EGYPT, the Raiyan impounding, Nile flood, Whitehouse *Eng* \* Sep 14-88, Sep 19-90; storage in, ed. Oct 16-91
- HALLINGTON, West, Henzell, inset *Inst C E* \* v 102 -90
- HUDSON, Wis. covered *E News* \* Mar 15-90
- MANCHESTER works, inset *Eng* Feb 5-92
- NASHVILLE, Tenn., Parsons *E News* \* June 16-88
- NEBRASKA City, Neb., failure of *E News* \* Apr 19-90
- NEWTON, Mass. covered *E Rec* \* Apr 18-91
- NEW York, reservoir 'M,' inset *E News* \* Mar 22-90
- PARIS, France, Montmartre 3-story covered *E Rec* \* Aug 9, abs. *Inst C E* v 100 -90 *Sc Am Sup* \* Mar 8 *The Eng* \* Jan 17-90; Bechmann, abs. *Inst C E* v 105 -91 *An Ponts* Feb -91
- PHILA., Conshohocken hill remark. breaks, Lukins *E News* Aug 18-88
- TORCY, France *R & Eng* \* Jan -90
- TORONTO, Ont., Can., Rose hill embank. *E News* \* Aug 2-90
- WHEELING, Va. *E News* \* Mar 12-92
- Resins**, waxes and solid paraffins, Church (full) *Sc Am Sup* \* Apr 9-92
- Retaining walls**, for earthwork, Greene *E News* \* Dec 29-88; design of, K. Allen *E Rec* \* Nov 12, 19; old revetment wall, Montreal har., Sproule *R & Eng* \* Dec *R Gas* \* Nov 18-92; M'Elroy, Nov 9-88. See also DAMS; HARBOR eng; R's, embank; RESERVOIRS
- Retort**, mechan., with continuous feed and discharge, Haig *E & Min* \* Jan 31-91 *J Soc Chem Ind.* See also GAS retorts
- Reynolds**, Edwin, por. *Cassier's* \* Mar -92
- Rhind**, James *Inst C E* v 99 -90
- Rice**, culture in cen. China, Franklin *Sc Am Sup* June 8-89; hist., Proctor, Oct 10-91, manuf., do. July 9-92



**Richards, Thomas M.**, por. *E & Min* \* Nov 29-90

**Richardson, Robert** *Inst C E* v 107 -92

**Richardson, William A.** *Locom* Apr -89

**Richmond, Va.**, eng. prob. at (canal, etc.) Adams *Am M E* \* v 12 -91 *Eng* Jan 9-91

**Riddell, Robert (full)** *Inst C E* v 106 -91

**Rigden, John L.** *Inst C E* v 109 -92

**Ring, Robert** *Inst C E* v 100 -90

**Rings**, thin elastic, flexure of, De V. Wood *Am M E* \* v 12-91

**Riotte, Eugene N.**, por. *E & Min* \* May 10-91

**River-gauging** at Vyrnwy reservoir, Parker, inset *Inst C E* \* v 92 -88

**River motor**, fluvial *Sc Am Sup* \* July 28-88

**River profile** of bottom register ap., Stecher *E News* \* July 25, n *R & Eng* \* Oct -91

**Rivers**, improvement, Atlan. coast, Craighill, *E Rec* \* Aug 11-25, discuss., insets *Am C E* \* v 19 -88, sedimentary discuss., Striedlinger, Worthen, Henshaw, insets \* v 20 -89; mean horse power of, calcs. variable stream and cost of replacing power lost by partial diversion of the flow, Grant, discuss. v 22 -90; self-purification of streams, Rafter, insets \* v 24 -91

*Am M E* river practice of the west (boats), Sweeney \* v 9 88; stream measurements, U. S. Geol. survey results, Newell (full) *Am Min* \* v 20 -92; signalling across, in India, Melhuish *El Rev Lond* Apr 18-90; future world's highway, Gribble *E Mag* \* Apr - June; flood effects in western, Going, Sep -92; mining in Cal., Boynton *E & Min* \* Sep 5-91

*E News* pollution of streams, Hering, Aug 4-88; comput. of discharges, G. Johnson, Sep 6-90; river pollution in U. S., C. Brown, Mar 21, 28, abs. *Inst C E* v 103 -91 *J Assoc E Socs*; self-purification of, Frankland *E News* Sep 5-91; discharge obs. of large streams, Davison *E Rec* May 7; months' imp., Corthell report, Aug 27, Sep 3-92; jetties for imp. estuaries, Haupt *F Inst* Apr -88

*Inst C E* simple method of ascertaining discharge, Harlacher, Richter, abs. \* v 91 -88; bars at mouths of tidal estuaries, Wheeler *The Eng* Feb 7, discuss., inset (very full) *Inst C E* \* v 100 -90; self-purification, Stearns, abs. v 105 -91, Meyer, abs. v 109 -92 *Mass State Bd. of Health*; crossings and bridge piers, Otagawa *R & Eng* \* Nov \* Dec -88; nav. river material, expt. researches ap. *Sc Am Sup* \* Sep 24-92



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- AIRE & Calder nav. and canal waterway, Bartholomew *E News* \* Aug 30-90
- AVON imp. below Bristol, Chatham, insets *Inst C E* \* v 98 -89
- BAVARIA, imp. *E News* \* Mar 17-88
- BILBAO imp. *E News* \* Aug 31-89, Churrucá report, abs. *Inst C E* v 78, 98, 104, insets, 107 -92
- BRAZOS, Tex., imp., jetties *E News* \* May 18, June 22-89
- BRENTA imp., Cesareni, abs. *Inst C E* v 99 -90
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- COLORADO cañons, availabil. for R. purposes, Stanton, discuss., insets (full) *Am C E* \* v 26 -92
- COLUMBIA, jetty *E News* \* Apr 18-91
- COSEL, imp. at, Oder river (Europe) *E News* \* May 3-90
- DANUBE imp. *E News* July 11-91 \* Apr 2-92; the Sulina mouth of, Kuhl, Hartley append., insets, *Inst C E* \* v 91 -88, inset \* v 106 -91
- DELAWARE, obstructions in *Sci Am* Mar 16-89
- ELBE, ht. prediction of, in Bohemia and Saxony, Harlacher, Richter, abs. *Inst C E* v 91; regulation between Melink and Koniggratz, Oelwein, abs. v 92 -88; Sax., flow measurements, 1886-7, Ringel, abs. v 95 -89
- JAMES, imp. at Richmond, Va., W. Adams *E News* Nov 22 -90
- LOIRE, imps., Paris exhib., map *Eng* \* July 19, 26-89
- MAIN, canalization between Frankfort and Mainz, abs. *Inst C E* v 92 -88 *Deut Baux* -87
- MISSISSIPPI imp., flood hts. in reach between Helena and Vicksburg, Starling, insets *Am C E* \* v 20 -89, keeping within banks, do. *E Mag* \* Apr -91; impending disaster on, June, prob., Dutton, Aug, Starling \* Nov -92
- E News* connecting with upper lakes, Handburg, Feb 18-88; Gov't. protective works, mat, Memphis \* Oct 26; levee con-



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- ODER, imp. at Cosel (Europe) *E News* \* May 3-**90**
- PORTLAND, W. T., imp., Freeman, inset *E Mag* \* Aug -**92**
- POTOMAC basin, hydrography of, Babb, discuss., inset *Am C E* \* v 27 -**92**
- RHINE reg. works, between Eltville and Oestrich, Imroth, abs. *Inst C E* v 92 -**88**; reg. at St. Gall, Wey, abs. v 103 -**91**
- RHONE, imp. of mouths of, Guerard, report abs. *Inst C E* \* v 101 -**90**. See also POWER, Rhone river at Geneva
- SEINE, lower, Suresnes locks and weir, Luneau, abs. *Inst C E* v 101 -**90** *An Ponts* \* v 18 -**89**; canalization of, abs. *Sc Am Sup* \* Mar 16-**89** *Genie Civil*
- STEEPING and Wainfleet Haven imp. *The Eng* \* May 13-**92**
- SUSQUEHANNA floods, Raymond report *E Rec* Jan 23-**92**
- WEAVER nav., Sauer *E News* Aug 30-**90**; Stoney's sluices, Manchester ship canal *The Eng* \* Jan 9-**91**
- WITHAM channel and outfall imp. works, Williams, discuss., inset *Inst C E* \* v 95 -**89** *The Eng* Dec 7-**88**
- YELLOW *E News* Mar 31-**88**
- Rivet** signs, uniform system of *E News* Jan 25, cor. Feb 9, symbols, cor. \* Mar 2, Seaman, cor. \* Apr 13-**89**; diag. \* Sep 15 -**92**
- Riveted** joints, on an angle, expts., Flint *Am C E* \* Oct 27-**92**; copper, strength *Eng* \* Apr 24; \* Dec 4-**91**; riveting tests, Buckholz \* Dec 6-**90**; diags. \* Feb 6-**92**; net section in, Cooper *R Gaz* \* Aug 22; plates, tests \* Oct 10-**90**; Allen (full) *Sc Am Sup* \* July 18-**91**; of max. strength, Nicolson *The Eng* Oct 19, Nov 9, 30-**88**. See also BOILERS, riveted joints
- Riveter**, Allen pneu. *Eng* \* Nov 23-**88**; Schonbach's hydr. \* May; hydr., 200-ton plant \* Feb 14, 14-**90**
- Road engines**, rollers *Cassier's* \* Aug-**92**; locom., Burrell *Eng* \* June 20; steam on common roads, McLaren, Nov 21 *The Eng* Nov 21 *E News* Dec 20; locom., Aveling & Porter \* June 28-**90**; traction, European experience, McLaren \* Apr 4; the Springfield steam roller, inset \* Nov 21-**91**; Burrell compound *The Eng* \* Dec 12-**90**; 8 h. p. compound \* Sep 11 -**91**



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*E News* valuation of road metal and setts for paving, Stock, Sep 22 *The Eng* Aug 31-88; country, in France, construct. and maintenance laws *E News* Feb 6, 23, Mar 2; country, legislation in Pa. Apr 6; construct. and repair of, London, Strachan, 13; good, value of, May 18; common, N. Jersey law, July 27; Am. legislation, bk. n Dec 7-89

*E News* country, notes, Downing, Feb 8; foreign highway construct. and maintenance, 22, Mar 1, 15, 29; maintenance, Roads Imp. Assoc., Lond. \* Aug 16; repair and maintenance of, England, Sep 18; road work in Richmond Cty., N. Y. Dec 13-90; country, money value of good, report, Feb 7-91

*E Rec* road making, Herschel (prize treatise) Mar 9, Apr 20, 27, May 4, 11; Greene, Aug 10 *Harper's W* Aug 10, 17; good, Pope *E Rec* 31, Shaler, abs. Nov 9 *Scribner's*; Bridgeport macadam, North *E Rec* Dec 28-89

*E Rec* resist. to traction, Hering, Jan 25; Penn. highways report, Feb 15; construct. and maintenance, Thompson (prize article) Mar 29, Apr 5-19, Pritchard, 19, 26, May 3, com. comments, 10; main, maintenance, Hooley, Aug 10; machinery, cost of, Oct 4-90; European sts. and highways, Dec 12; Brookline, Mass. macadam, contract, 19-91

*E Rec* county, construct. and repair, Owen, Jan 30 *Sc Am Supp* Mar 12 *E News* Feb 13; road across a marsh, Waite cor. *E Rec* Feb 20; highway roller repairs, French system, Durand-Claye, Mar 5, Bacot, cor. 19; road making in eastern Mass., McClintock, 26; administration of French highways, Neff, Apr 16; Telford road making, Lenox, Mass. \* 30; instruction in highway eng., C. Allen, June 11, July 2, 23, (full) *Soc Arts Mass* -91; highway construct., disputed points, Owen, Nov 19 -92 *Am C E*

*Inst C E* roadways construct. across peat bogs, Schacht, abs. v 104 -91; highway, location, ed. *R & Eng* \* May -90; sections, Prov., R. I. \* July; Janvier *Sc Am Supp* Feb 27; legal



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responsibility for defective highways, *Bly St R J* Mar -89;  
Brighton foreshore imp. *The Eng* July 12-89. See also **MUNIC.**  
eng; **PAVEMENTS**; **STREETS**

**Road** vehicles, draught and haulage of *Sc Am Sup* \* Dec 5 *The Eng* \* Oct 16, cor. Dec 4 \* 11, 25-91

**Roanoke**, Va., survey of *E News* \* Jan 9 \* June 23-92

**Roberts**, Peter *Inst C E* v 96 -89

**Robertson**, Henry *Inst C E* v 93 -88

**Robertson**, James (full) *Inst C E* v 99 -90

**Robinson**, Moncure (full) *Am C E* v 26 -92, n *R Gas* Nov 13-91

**Robinson**, S. S., por. *E & Min* \* Apr 11-91

**Rock**, drilling machine, hydr. *Eng* \* Feb 17-88; Dubois' boring machine, Paris exhib. July 12-89; M'Culloch's drill, Rio Tinto \* Sep 12-90; drills, Carbutt & Davey, Mar 27; and ore breaker, Gates I. Co., Chic. \* June 19-91; and ore crusher, Brennan *E News* \* Oct 18-90; removal under water without explosives, Lobnitz, inset *Inst C E* \* v 97 -89. See also **DISINTEGRATOR**; **DRILLS**; **MILLS**; **QUARRIES**; **STONE** and names of rocks

**Roe**, John P. *Inst C E* v 98 -89

**Roehricht**, Richard H. O. *Inst C E* v 106 -91

**Rogers**, William *Inst C E* v 95 -89

**Rolling** mill engines, reversing, Krupp works, Essen, Ger., inset *Eng* \* Sep 5-90; details \* Dec 4-91; 10,000 h.p., Jarrow *The Eng* \* Aug 9-89

**Rolling** mills, Simond's universal *Eng* \* May 25 *Sc Am Sup* \* May 5-88 *Iron Age*; 15 in. 3- high blooming, Lack. I. & C. Co., Scranton, Pa., inset *Eng* \* Jan 23; rolling fluid metal, H. Bessemer \* Oct 9-91; failures of chilled iron rolls, Winder \* Oct 21-92  
*E & Min* construct. of passes in rolls for reducing metals, Hewitt, Aug 25 \* Sep 1-88; Am., evolution of, R. Hunt *E News* Nov 28, 28, (full) *R Gas* Nov 20-91 *Am M E*; universal, for girders and cruciform sections, Sack *Sc Am Sup* \* Jan 7-88 *The Eng* \* May 10, 17-89. See also **STEEL**, German works

**Rome**, excavs. in ancient, Lubbock *Sc Am Sup* Mar 22-90; devel. of capital at, Hemphill, Oct 1-92

**Roofing**, slates, strength and weathering qualities, Merriman, discuss., insets *Am C E* \* v 27 -92 *E & Min* Sep 24-92; paper for material *E News* Sep 21-89; roll tar paper manuf. (full) *Sc Am Sup* Sep 26-91; tiles glazing, terra cotta, etc. July 9-92



**Roofs**, det. of stresses in elastic systems by method of least work, Cain, inset (full) *Am C E* \* v 24-91; Cathcart st. station, Greenock R., inset *Eng* \* Mar 22-89; Fairfield works boiler shop, Govan \* Oct 3-90; July-Sep -92

*E News* 22d reg't. armory drill room, N. Y. \* Apr 13-89; truss failure, Troy, Ala., cor. \* May 9-91; trusses, coeffs. for figuring strains in, table \* Aug 11; 4-mile crib, Chic. \* Sep 15-92

*E Rec* 12th reg't. armory, N. Y., inset \* Jan 7; truss, So. Brooklyn R. car shed \* Mar 17; a cantilever \* Aug 4; St. Paul church \* Oct 27; rink truss \* Nov 17-88; So. armory drill-hall \* Apr 20; armory, Cin., O. \* Dec 7-89

*E Rec* iron mill \* Jan 25 \* Feb 1-90; arcade, Cleveland \* Mar 21, 28 \* Apr 4; erection traveler, Newport News Ship Bld. Co. \* Apr 25; Charleroi plate glass works \* May 9; iron shop \* Aug 29; strains in trusses *Locom* \* May -91

*R Gaz* Westinghouse machine shop \* June 6; rational trusses Arajol, June 27, cor. *The Eng* \* Oct 24-90; roof water removal, Porter *Sc Am Sup* \* May 18-89; iron *St R J* \* Aug -90; iron, So. Mahratta R. *The Eng* Oct 19-88; barracks at Aden, Aug 30, Sep 6-89; a rational truss, Graham \* May 16-90. See also BUILDINGS; EXHIBS., U. S. Columbian — U. S. Gov't. bld; FACTORIES; MILLS; Rs, stations, etc.

AGRIC. bld., Chic. exhib. *Eng* \* Apr 29 \* May 6-92

ALLEGHENY County court-house *E Rec* \* Nov 10-88

CARLISLE Corp. markets *The Eng* Mar 30, Apr 13, 13-88

CHICAGO Auditorium trusses *E Rec* \* Nov 22, 29-90

DULUTH Union depot *E Rec* \* Feb 6 \* Mar 12, 19, 26 \* Apr 9, 23, 30 \* May 21-92

DUNDEE R. station, Caled. R., inset *Eng* \* June 28-89

EDINBURGH exhib, inset *Eng* \* Apr 11-90

FOUNDRY plant, the Worthington, Elizabethport, N. J. *E Rec* \* Apr 2-92

HORTICULTURAL bld., Columb. exhib. *Eng* \* Nov 11, 18, 25-92

MACHINERY Hall, Columb. exhib. *E Rec* \* Dec 24, 31-92

MADISON Sq. Garden bld. *E Rec* \* Jan 17-31-91

MANUF's bld., Columb. exhib., insets *E News* \* July 28 \* Sep 1, 8-92

OLYMPIA, Nat. Agric. Hall, erection, Read *Eng* \* Dec 23-88

PARIS exhib., Machin. hall, inset *Eng* \* June 1-88; blds. \* May 3-89



**Roofs, PENN. R.**, Jersey C. terminal station *Eng*\* Apr 1-92, train shed, inset *R Gaz*\* Oct 2-91.

TRANSPORT. bld., Columb. exhib. *Eng*\* Dec 2, 9, inset *E News*\* 29-92

U. S. Columb. exhib. blds. *Eng*\* Oct 30, inset\* Nov 13-91 *E Rec*\* Aug; Gov't. bld. *Eng*\* June 10-92

**Rope** driving power transmiss., and cable, best speed of, Cooper, discuss. *Am M E* v 9-88; two haulage systems, Norris *E Rec*\* June 27\* July 18 *Am M E*\* v 12; C. Hunt\* v 12-91 *E News*\* Nov 15-90 *E & Min*\* Jan 31-91 *E Rec* Nov 15 *Pwr*\* Dec-90, Jan-91; Grimshaw *Cassier's*\* July, influence of longitude on, do. Oct; ed. *El Rev Lond* Sep 16-92; underground haulage, J. B. Smith *Eng*\* Feb 17\* Mar 2, 23; Otto system haulage\* Apr 6-88; Miller, diag. *E News*\* Dec 6 *The Eng* Dec 19-90

*Pwr* Seymour\* May-July\* Nov-89\* June\* Sep-90; at Willamette mills, Portland, Or.\* Jan-92; *Sc Am Sup*\* Mar 24-88; by manila ropes, Gregg\* May 24-90 *J Assoc E Socs*; *Sc Am Sup* May 24-90; \* Mar 24-88; *St R J*\* Apr\* Sep-90. See also POWER transmission; TELPHERAGE

**Ropes**, manila and hemp, strength and power transmiss., Miller, diag. *E News*\* Dec 6; *The Eng* Dec 19; and hitches *E Rec*\* July 19-90; strength of, Duboul, abs. *Inst C E* v 92-88, do. expts., French *R Gaz* June 29-88. See also CABLES; WIRE ropes

**Ropes** Pass, Texas, Kent *E Mag*\* June-92

**Ross**, George H. *Inst C E* v 95-89

**Rotary** boilers connections *Locom*\* Aug-90

**Rotary** engines, ancient and mod., Jamieson *Cassier's*\* Feb-92; Brown's *El Rev Lond*\* July 10-91; duplex *El Rev*\* Nov 29, n *El Wld*\* Apr 12-90; the Rota *Eng*\* July 20; Lidback's vibrating *F Inst* Oct *R & Eng*\* Nov; Bullock *Pwr*\* Apr; Rigg's *Sc Am Sup*\* Mar 10-88; revolving cyl.\* Nov 8; *The Eng*\* Mar 7, valve gear\* Apr 25-90, \* Jan 23; hydr. winding with variable stroke\* Oct 16-91

**Rotary**-piston valve, engine governing by, Aldrich *Am M E* v 13-92

**Rotary** pumps, Johnson's *The Eng*\* July 3, boiler feeder\* Dec 25-91. See also PUMPS, rotary

**Rouen** port, France *Eng*\* Oct 11-89

**Routing** machine, Parry's *Sci Am* Mar 23-89



**Routledge**, Thomas *Inst C E* v 92 -88

**Rowland**, Henry A., por. *El Wld* \* Mar 9-89

**Royal Institution Soc.**, Lond. pro. *El Rev Lond* May \* June 12-26-91; *Eng* May 16, 23-90, May 22, 29, June 5-26, July 8, 10, Dec 18, 25-91, Jan 8-22, Feb 12, Mar 4, 11, 25, June 17, July 22, Aug 12, 19, Dec 9, 30-92; pors. members *Sc Am Sup* \* Sep 7-89; June 14-90

**Rubber**, india, properties, in Russian navy, Vladimiroff, abs. *Inst C E* v 109 -92; *Sci Am* Apr 6-89; vulcanization of, Gerner *Sc Am Sup* Jan 4; \* July 12, Sep 6; indus., hist. (Hayward's expts.) Oct 18; vulcanization and decay of, notes, W. Thomson, Dec 6-90; supplies sources, Sherman, Feb 6; gathering in Amazon valley, Kerbey, Mar 19-92. See also GUTTA-percha

**Rundle**, Cubitt S. *Inst C E* v 100 -90

**Russ**, William *Inst C E* v 104 -91

**Russia**, commerce and mineral industries, ed. *Eng* Dec 25-91; diagonally through, ed. cor. *E News* Oct 11, 18-90

**Russian sheet iron** *Sci Am* Feb 2-89

**Ryan**, Jeremiah *Inst C E* v 107 -92

**Sabine Pass imp.**, cor., Turtle, Haupt *F Inst* May -88

**Sacre Charles R.** *Inst C E* v 98 -89

**Safety lamps**, the Thorneburry *Eng* \* Nov 15-89; miner's, notes, Hughes *E & Min* \* Mar 28-91

**Safety valves**, lever (full) *Locom* \* July -92

**Sahara**, the, James *Locom* Aug -89 *Sc Am Sup*

**Salls**, action of, Vogt, cor. *Eng* \* Oct 11 *Sc Am Sup* \* Dec 21 -89

**St. Louis, Mo.**, pavements, Macklind *E News* Mar 14; topog. survey of, Connet, Oct 31-91; pub. works management, Jan 23; new growth of, Ralph *Harper's M* \* Nov -92. See also PAVEMENTS; SEWERS; STREETS; WATER-works, etc.

**Salida**, Col., inset *E & Min* \* Dec 21-89

**Salmond**, John M. *Inst C E* v 102 -90

**Salt**, works, obtaining brine, Brush, Tully Pipe Line Co., N. Y., discuss., insets *Am C E* \* v 23 -90 *E News* July 5-90; the Petite Anse mine, La., Pomeroy *Am Min* \* Apr 17-89, Bolton *Sc Am Sup* July 28, Pomeroy \* Nov 10 *E & Min* \* Oct 6-88; manuf., Pick's system in vacuo \* July 12-90; wells, Onondaga, '90, Engelhardt, Feb 21-91; U. S. produc., do. Jan 2; manuf., China \* Feb 6-92



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*Sc Am Sup* from sea-water, Merrill, Apr 20; manuf. n Sep 7 -89; works, Cheshire, Apr 19; manuf. in vacuo, Nursey \* July 26; mines, Retsof, Greigsville, N. Y., Sheldon, Dec 20-90; N. Y. indus. \* Nov 14-91; *Iron*

**Salter**, Frank *Inst C E* v 96 -89

**Samoa** *Century* May -89

**Sand** pumping, dredging and Mersey bar, ed. *Eng* Apr 11-90

**Sandstone** indus., U. S., Day, Cens. bull. abs. *E & Min* July 4 *E News* 18-91

**Sanitary** engineering, Manchester, England, ed. *Eng* Sep 30; bad air in theatres, Montgomery *E Mag* May -92; san. sci. in the home, Richards *F Inst* Aug; safety in house drainage, Hoyt *Pop Sci* July; Bayles *Sc Am Sup* Dec 15-88; legislation, England, results, Calkins, inset *Tech Q* \* Dec -91. See also BUILDINGS; Health; MUNIC. eng; PLUMBING; REFUSE disposal; SEWERAGE

**Santoy**, John B. Austis du *Inst C E* v 96 -89

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*E Rec* com. report, ed. Aug 13, Dec 3; smoke consumer, n \* Nov 12-92; aut., Vulcan fur. *Pwr* \* Nov -90; *R Gas* Jan 8, Feb 26, 26; St. Louis com. report (full) Apr 1-92; condensation of carbon particles, Irvine *Sc Am Sup* Mar 7-91; manufacturing smoke, Davis, Nov 29-90 *Chem Tr J*; ed. *The Eng* July 26-89; Ackroyd-Willoughby's preventer, trial \* May 15-91; ed. Jan 8; in boiler furs., Sennett, n \* Aug 26-92. See also BOILERS, furnaces, smoke preventing

**Snow** removal from city streets, ed. *E Rec* Jan 9-92. See also R's, snow ploughs

**Snow-shoes**, Norwegian Skee, North *E News* \* Jan 18, true Nor. Ski \* Mar 20, n *Sc Am Sup* \* Feb 22 \* Apr 26-90

**Soap** indus., Ivorydale plant (full) *E Rec* \* May 2; Penn. R. specs., C. Dudley (Chem. applied to R's) *R & Eng* Dec -91; resin as an emulsifying agent, Collier *Sc Am Sup* May 3; anal. June 14-90

**Soap** bubbles expts., Boys *Sc Am Sup* \* July 14-88 *Eng Mechanic*

**Soares**, Plotino *Inst C E* v 101 -90

**Societies**, Soc. of Arts, Lond, hist. *Eng* July 24, 31, Aug 7, 14, 28, Sep 4, 25, Oct 16, Nov 20-91; Soc. Arts, Mass., list members, pro. *Tech Q* Apr -92. See also ENGINEERS, Civil — Mechan; LOCOMS., Am. Master Mechanics; MINING engineers; R's, Car Builders, Master — Master Mechanics; ROYAL Soc; TECHNICAL Soc., etc.

**Soda** nitrate, market *E & Min* Jan 4-90; Nichol's report, abs. Jan 17-91. See also NITRATES

**Soils**, contrast in col., high and low latitudes, Crosby *Tech Q* Apr-91

**Solar** radiation intensity, compar. with elec. arc, Langley *El Eng* Jan -90. See also SUN

**Sound**, diffraction of, Stevens *F Inst* \* June -89; wave theory of, Hall *Locom* Mar, Apr, Aug; vel. and adiabatic compression, Mott *Sc Am Sup* June 13; Helmholtz's theory of consonance, Cross *Tech Q* Dec -91, least number of vibrations necessary to det. pitch, do., Maltby, Oct; vel. measurements by *The Eng* Aug 26-92

**Sounding** ap., Belloc's *Sc Am Sup* \* Oct 31-91 *Genie Civil*

**South Sea Islands** *Eng* \* Jan 18, 25 \* Feb 1, 15, 22 \* Mar 1-89

**Space**, constitution of, Hirn, bk. review *Eng* Nov 8-89 *Sc Am Sup* Jan 11, DeV. Wood, Apr 5-90



- Spain**, (Spanish) Armada defeat in 1588 *Sc Am Sup* \* Aug 25-88; new customs tariff *The Eng* Sep 23-92
- Spectroscope**, spectroscopic researches, ed. *Eng* Apr 5-89; Halsted observ. \* July 22-92; *Locom* July -89; table, construct., Miller \* June 23 \* Nov 17-88, with fluid prism, do. \* Apr 27-89
- Spectrum** anal., Macadam *Sc Am Sup* June 9-88. See also LIGHT, spectrum
- Speed**, recorder, elec., Barrus *Am M E* v 9 -88; trials, register for, Weaver *El Eng* \* Apr 1-91; and distance recorder, Kapteyn's *Eng* \* Mar 29; recorder, Buss' Tachymeter \* July 12, 12, Paris exhib. \* Aug 30-89; mile records, n *E Mag* Apr -91, do. of world *E News* June 9-92; Willis' speedometer *Sc Am Sup* \* Jan 14-88; indic., Heath's self-timing *The Eng* Oct 26 -88. See also R's speeds
- Speed** regulator, Foote's aut. intermediate *El Eng* \* Oct 22 *El Rev* \* Dec 6 *El Wld* \* Oct 25 *Pwr* \* Nov -90
- Spellier**, Louis H. *F Inst* Nov -91
- Spelter** produc., Europe and U. S. *E & Min* Mar 31-88, '90, Mar 28-91; indus. '89, Jan 4-90, Jan 3-91
- Spencer**, Charles T. *Inst C E* v 95 -89
- Spencer**, George *Inst C E* v 97 -89
- Sperry**, Elmer A., por. *El Wld* \* June 15-89
- Spice**, Robert P. *Inst C E* v 97 -89
- Spike** forging machine, the Burton elec. system *El Eng* \* Jan 27-92 *El Rev* \* Sep 13-90
- Spikes** and drift bolts, holding power of, expts. *E News* Sep 26-91. See also R's spikes: TRACK
- Spindles**, spinning, Stockton Bates' support for, com. report *F Inst* \* Aug, tests, Webber, do. Sep -90
- Spon**, Ernest *Inst C E* v 104 -91
- Sponges**, Florida *Sc Am Sup* May 3-90
- Spontaneous** combustion, human, Stockwell (full) *Sc Am Sup* Oct 5-89; Tallock, Apr 18-91
- Sprague**, Frank J., por. *Cassier's* \* Aug -92; inventions defence (full) *El Rev Lond* Apr 6-88; por. *El Wld* \* Sep 7-89
- Springs**, spiral, deflection, Young *Inst C E* \* v 101 -90; formulas for, Penn. R. *R Gaz* \* Nov 15-89; helical, cal., Lecuw \* Jan 15-92; metal coils, friction of. H. Shaw *Sc Am Sup* \* Nov 10-88; cal. of, Reuleaux table and formulas \* Dec 14 -89



**Sprinklers**, aut., det. of sensitiveness, Nagle *Am M E* \* v 11-  
-90. See FIRE protection, sprinklers

**Stamp** cancelling and post-marking machine, the Ethridge *E News* \* Oct 5-89

**Standards**, J. W. See *Am M E* v 10 -89. See also WTS. and measures

**Standfield**, John *Inst C E* v 101 -90

**Standpipes** (water-works water towers) *E News* Cal. redwood, C. Allen, \* Apr 28; Stephens, Oct 6; thickness of plates for, K. Allen, Dec 15-88; aut. gate closing ap. \* Sep 28-89; Brooklyn, N. Y. tower, proposed \* Feb 7-91; Worms, Ger. \* Feb 13; the Sheffield \* Mar 19; Des Moines, Iowa \* Apr 9 -92

*E Rec* Bellevue tower \* June 1 \* Aug 10; Pullman, Ill. \* Dec 28-89; prize designs, insets \* Mar 15-29 \* Apr 5-26-90; Defiance, destruction, foundation \* Apr 11, 11; the Norton, Vyrnwy aq., Liverpool \* Oct 3; Aurora, Neb. \* Nov 21-91; Worms \* Jan 30; Des Moines, Iowa \* Feb 6; Mannheim, Ger. Sep 3-92

*Inst C E* Seneca Falls, N. Y., bursting, abs. v 91 -88 *E Rec* Nov 12-87; standpipes, Parker *Lehigh Eng J* Apr -88; tower at Worms *The Eng* \* Apr 29-92

**Stanford**, Walter H. C. *Inst C E* v 97 -89

**Stanley**, William, Jr., por. *El Eng* Aug 20-90

**Stanton**, Frederick S. *Inst C E* v 108 -92

**Stanton**, John, por. *E & Min* \* Sep 19-91

**Starch**, iodide of, Stocks *Sc Am Sup* Jan 14-88

**Stars**, computing apparent places for latitude work, differential method, Preston *F Inst* Apr -89

**Statter**, Thomas *Inst C E* v 109 -92

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**Statues**, Franklin, Allison, inset *E Mag* \* Mar -92; Quauhquemoc, Mex. *E News* \* Feb 11-88

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*Cassier's* steam power and the coal bill, Pray \* Nov \* Dec -91; future of, Colvin, Feb; dry, mechan. methods of securing, Carpenter \* Aug; exhaust util. from elec. light station *El Wld* \* Feb 20 -92; effic. at high pressures, Beaumont *E News* Feb 9-89 *F Inst* Dec *R Gas* \* Nov 2 *Brit. Assoc.*, *Eng* \* Nov 2-88; district distrib. in U. S., Emery, Mar 29; rationalization of Regnault's expts., Gray \* July 12-26; discuss., insets (full) *Inst M E* \* July *The Eng* July 19-89

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*R Gas* the Hussey reheater \* June 8-88; econom. limit of pressures, Nagle, Nov 13-91; steam plant effic., D. V. Wood *Sc Am Sup* Sep 1-88; momentum in steam pipes, Denton, n \* June 22-89 *Steven's Indic*; pressure of saturated, Peabody *Tech Q* May; flow in tube, do., Buttolph, Oct; econ of low pressure *The Eng* Feb 17-88. See also BOILERS; ELEC. lighting stations; ENGINES; MARINE — PUMPING engines, etc; R's, elec., power stations

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BOILERS, the Zell *El Rev* \* Aug 31-89. See BOILERS

CALORIMETER, universal, Barrus *Eng* \* July 25-90. See CALORIMETERS



**Steam CARRIAGE**, Serpollet's phaeton *Eng* \* Mar 13 \* Aug 14  
*R & Eng* \* June \* Aug -91 *Sc Am Sup* \* Sep 22-88, tri-  
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**CRANE**, 150-ton, Woolwich arsenal *The Eng* \* Oct 9-91. See  
**CRANES**

**ENGINE** Maker's Soc. *Eng* Feb 22-89

**ENGINEERS**, Stationary, Nat. Assoc. *Pwr* Sep -88

**ENGINES**, the Sickles *E I Wld* Feb 22-90. See **ENGINES**

**FIRE** engines, hand carriage *The Eng* Dec 7-88; for Sydney,  
 performance \* Oct 9-91. See also **FIRE** engines

**FITTINGS**, eccentric *Locom* Mar -88 \* Aug -90. See also  
**PIPES**, etc.

**GAUGES**, recording pressure, Bristol *Am M E* \* v 11 -90 *E News*  
 \* Dec 7-89 *The Eng* \* Jan 23-91; Calkins *Cassier's* \* Apr  
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*Eng* \* May 16-90. See also **FORGING** machines; **HAM-**  
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**HEATING**, Worthen discuss., inset; district systems; Emery, in-  
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*C E* \* v 97 -89, abs. v 106 -91 *F Inst* Mar *Sc Am Sup* Mar  
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 aldy's system *The Eng* \* Aug 29-90. See also **CARS**, heating,  
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**INJECTORS**. See **INJECTORS**

**JACKETS**. See **ENGINES**, steam jackets

**JOINT**, Moran flexible *E News* \* Aug 20 *R Gaz* \* July 31  
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**LOGGER**, Glover & Chandler, n *R Gaz* \* July 26-89

**LOOP**, the, Kerr *Eng* \* June 13 *E News* Aug 2-90, (full) *E Rec*  
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**PRESSURE** regulator, Foster's *R Gaz* \* Mar 20-91

**PUMPS**, direct acting, use of steam expansively in, Holloway *Am M E* \* v 11 -90 *E Rec* \* Nov 30, Dec 7-89 *Am Eng'r*; Hall duplex *E & Min* \* Dec 7; for boiler feeding *Locom* \* Sep -89. See also PUMPS

**REDUCING** valve, the Mason *Sci Am* Mar 9-89

**SEPARATORS**, Barnard's, Stratton's *E News* \* Jan 18-90; effc. of, tests, Carpenter report, Sep 12 *Pwr* \* July -91

**SHOVEL**, portable, Bay C. Indus. works, Mich. *E News* \* July 5 -90

**STAMP**, the Tamarack *E & Min* \* Jan 28-88

**TRAP**, the Korting *Eng* \* May 24-89; the Expandisc *The Eng* Mar 30-88

**TURBINES**, note on, Webb *Am M E* v 10 -89; compound *Sc Am Sup* \* Feb 18-88

Dow's compound motor *El Wld* \* Feb 28-91 *E News* \* Feb 27-92 *Pwr* \* May -91 *R Gaz* \* Jan 24 *Sc Am Sup* \* Apr 19 *The Eng* \* Mar 14-90 *J Assoc E Socs*

LAVAL's *Sc Am Sup* Apr 23-92

PARSON's compound condensing, trials, Ewing report *Cassier's* \* Dec *El Eng* \* Nov 30 *El Rev Lond* Jan 8 \* Nov 18 *El Wld* \* Jan 30 \* Dec 10 *E News* \* Feb 27 *R Gaz* \* Dec 2-92; *Eng* \* Jan 18 \* Nov 10-88 *E & Min* \* Jan 19-89, discuss., insets *Inst M E* \* Oct -88

**YACHTS**. See YACHTS, steam



**Steamboats**, on Rhine *The Eng* Aug 10; small pass., Plymouth harbor, Nov 9-88. See also STEAMERS, paddle

**Steamers**, ship's protection against foundering from injury to their shells and use of armor, Barnaby *Am Min* v 19-91; points in the philosophy of, Durand *Cassier's* \* Nov-92; building in Am., See *E Mag* \* May -91

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*Eng* paddle, fast \* Jan 9; laws of propul., Mansel, Mar 6; loading, effect of on form of vessels, Phillips \* Apr 10; Atlantic records, early str. 10, 24, May 1, 8, table, June 19, July 10; water-tight bulkheads in, ed. June 26; and yachts comparison, examples, A. Jones \* July 3; oil-tank, Eldredge \* 31, Aug 7; mercantile, types and proportions of, Martell, Aug 7, 14; bulkhead's spacing and construct., com. report \* Oct 2; Atlan. liners, past, present and future \* Dec 4-91

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*E News* steering, Hornig's direct power system \* Mar 23; new class of Atlan. Aug 17-89; ice-breaking str. Nogat, Vistula river, Devrient \* Sep 6, Pearsons cor. \* Oct 25; steering, the Kunstadter screw \* 25-90; Atlan., dimens. Oct 20-92

*Inst C E* ice-breaking, for winter nav., Runeberg \* v 97-89; Rhine goods traffic, Schnell, abs. v 99-90 \* *Zeit Bauwesen* -89; the race across the Atlan., Dyer (prog.) *Littell's* Apr 23-92 *Scot Rev*; Lloyd's register *Locom* Apr; fast Atlan. speed and dimens. June, July -89, Atlan. record (fast) Aug -91; design, experimental aid in *R & Eng* Dec *Sc Am Sup* Sep 28-89 *Steamship*

*Sc Am Sup* first Atlan., Fuller, Mar 10-88; first ocean \* May 9; Atlan. passages, table, Aug 15-91; Atlan. (dimens.) \* Jan 16; 24-knot, Feb 13-92 *The Eng*; building of an ocean grayhound, Rideing *Scribner's* Apr -89

*The Eng* vessels, relation between power and speed, Mansel, Dec 23-87, Mar 30, laws of propulsion, do. (very full) July 27, Sep 7, Oct 12, Nov 28-88, Jan 25, May 24, July 5, Aug 2, 30,



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Oct 11, Dec 6-**89**, correction, do. cor. Oct 31-**90**, det. of coef. between power and speed, do. Apr 10, power expend. in and rel. effcs. June 19, resistance of, Dec 11-**91**, propul. July 1, Atlan. liners, n Sep 2, paddle wheel and screw, compar. effc. Oct 7-**92**

*The Eng* Atlan., ed. Aug 3, Turner cor. 31; iron and steel stern strengthening of, Sep 14-**88**; screw shafts repairing, str Tartar \* Jan 18; Atlan. racing, ed. Sep 6-**89**; paddle, high speed \* Aug 1-**90**; funnels, ed. June 19-**91**; L. Geneva pass. \* Aug 5; Atlan., future of, ed. Nov 18, cor. Dec 2-**92**. See also MARINE eng. — boilers — engines; NAVIES; NAV., India inland; STEAMBOATS

ALFONSO XII *Eng* \* Feb 15, inset \* Mar 1-**89**

ANN Arbor R. car transfer *R Gas* \* Aug 19-**92**

ARGENT. Gov't., stern-wheel, inset *Eng* \* Dec 16-**92**

BALTIMORE, dimens. *The Eng* Sep 14-**88**

BOSPHORUS, paddle, steel, for *The Eng* \* Nov 7-**90**

BOSTON, Nova Scotia & Boston pass., inset *Eng* \* Sep 18-**91**

BRITTANNIC, White Star unprecedented record *The Eng* Sep 12-**90**

CALAIS-Douvres, Lond., Chat. & Dover R. *Eng* \* June 14-**89**

CITY of Berlin *The Eng* Feb 3-**88**

CITY of New York, Inman *Eng* \* Mar 1-16, inset \* June 22, machin. \* Aug 3, 24: dimens. *E News* Aug 11; *R & Eng* \* Sep *Sc Am Sup* \* Apr 14 *The Eng* July 13, 27-**88**

CITY of Paris, Inman *Eng* Apr 26-**89**, accident, ed., inset \* Apr 18, ed. June 27, Mueller cor. \* July 11-**90**; ed. \* May 8-**91**; pumping mach. of *E News* Apr 20-**89**; accident, Gillham, ed. Apr 26, 26-**90**; *R Gas* May 17-**89**; *The Eng* Oct 26-**88**; accident \* Apr 18, 25, June 20, inertia stresses, Greenhill, 27, 27-**90**

CLYDE, Roy. Mail Stm. Packet Co., inset *Eng* \* Sep 26-**90**

COBRA, Royal Mail paddle *Eng* \* Aug 2-**89**

COLUMBIA, Hamburg-Am. twin-screw, 10,000 ton *Sc Am Sup* \* Jan 4-**90**; insets *The Eng* \* Oct 25 \* Nov 8-**89**

CONNECTICUT, Prov. & Stonington, inset *R & Eng* \* Aug -**88**

DOUNE Castle and Lismore C., Castle line, inset *Eng* \* Oct 2-**91**

DUNOTTAN Castle, So. African mail *Eng* \* Jan 2-**91**

ELETTRICO, pass. *The Eng* Nov 16, 16-**88**

EMPRESS of India, Can. Pac. R., inset *The Eng* \* Sep 5-**90**



- Steamers, FRIESLAND**, Red Star liner *Eng* \* Nov 8-89  
 FURST Bismarck, Hamburg-Am., twin-screw, insets *Eng* \* Apr 1, 22-92  
 GLENGYLE and Glenshiel *The Eng* July 5, 5-89  
 GREAT Eastern, value to break up, n *E News* Dec 15-88 ; fate of, Jan 2-92 ; last days of (full) *Sc Am Sup* \* Nov 28 *The Eng* \* Oct 30-91  
 HYGIEA, paddle pass., inset *Eng* \* Nov 7 *The Eng* \* Oct 17, inset \* Nov 7-90  
 IBEX, Great West. R., twin-screw *The Eng* Sep 18-91  
 INDIA, engines and boilers, inset *Eng* \* May 1-91  
 IONA, trials, Kennedy report *The Eng* May 8, 22-91  
 ISLANDER, Napier, inset *Eng* \* Sep 28-88  
 KOH-I-Noor, Thames excursion paddle *Eng* \* July 15 *The Eng* \* 8, 8-92  
 LANCASTRIAN, Leyland line *The Eng* Oct 30-91  
 LE Louvre, central screw *Sc Am Sup* \* Nov 12-92  
 LORD of the Isles, Clyde pass., insets *Eng* \* July 1, 15-92  
 LYDIA, Lond. & So. W. R. Channel str. *Eng* \* Sep 4-91  
 LYNX, Antelope and Gazelle, Great West. R., inset *Eng* \* May 30, engines and boilers \* June 13-90  
 MAJESTIC, White Star line *Sc Am Sup* \* Oct 11-90  
 METEOR, trials, Kennedy report *The Eng* \* May 3, ed. 10, *Inst M E* pro. 17-89  
 MODJESKA, twin-screw, inset *Eng* \* Oct 4-89  
 NOMADIC and Tauric, White Star, inset *The Eng* \* July 24-91  
 NORMANNIA, Hamb.-Am. twin-sc. *Eng* Jan 31, inset \* Aug 29-90  
 OPHIR, Orient Stm. Nav. Co. (Austral.), twin-screw *Eng* \* Dec 11 *The Eng* Sep 18, inset \* Nov 20, 20-91  
 PARIS and Rouen, Lond. & Br. R., Channel *Sc Am Sup* \* May 18, inset *The Eng* \* Mar 15, Sep 13, 13-89  
 PELOTAS, Brazilian, engines and b's, inset *Eng* \* June 10-92  
 PENINSULAR, Penin. & Oriental *Eng* Dec 7-88  
 PERU, Pac. Mail, launching curves of *The Eng* \* Sep 16-92  
 PLYMOUTH, Fall River line *Eng* \* July 31-91  
 PURITAN, Fall River line, steel, elec. light decorative features *El Wld* \* Aug 3 ; Am. *The Eng* July 26-89 ; *Eng* \* Jan 16, 23-91  
 RE Umberto *The Eng* Nov 2-88  
 ROME, Penin. & O., lengthening *The Eng* Oct 2-91  
 RUAHINE, New Zeal. Shipping Co. *The Eng* \* Apr 1-92



- Steamers**, SCOT, So. Africa Roy. Mail, Union S. S. Co., twin-screw  
*Eng* \* July 3, 10, 24 *Sc Am Sup* \* Aug 8 *The Eng* June 5, insets  
 \* July 3, 10-91 *Industries*
- SPREE, No. German Lloyd *Eng* Apr 24-91
- SULTAN, raising of, ed. *The Eng* Sep 13-89
- TARTAR, speed trial, Mansel, n *The Eng* Dec 23-87, June 29-88
- TEUTONIC, White Star, inset *Eng* \* Dec 19-90, cor. Jan 9, (full)  
*Sc Am Sup* \* Feb 7, 14-91 *The Eng* Aug 9-89, inset (full) \*  
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- TYNWALD, Isle of Man Stm. Packet Co. *The Eng* \* Aug 28, inset  
 \* Sep 11-91
- ULUNDA, raising *The Eng* \* Mar 27-91
- VILLE de Douvres, trial, Kennedy *The Eng* \* May 13, 20-92  
*Inst M E*
- WAESLAND, Red Star line *Eng* Dec 20-89
- WHALEBACK, 'C. W. Wetmore,' Am. cargo *Eng* \* July 31-91,  
 Goodall \* Apr 29-92 *The Eng* \* Aug 7-91
- WHITE Star S. S. Co's *Eng* Jan 25-89. STEAMSHIPS, See STRS.
- Steel**, properties and use in structures and heavy guns, Metcalf, bk.  
*Am C E, E Rec* Dec 17, 31-92; and iron, compressive strength,  
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- Am M E* plates, injury by punching or shearing, Hawkins;  
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- Am Min* manganese-steel, method for es., Julian; colorime-  
 tric carbon test, inorganic standards for, T. Robinson; open-  
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- Am Min* Bess., sulphur in, Cabot; open-h., physical and  
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 inset *Am Min* \* v 19; Bess. proc., notes on, Howe (very full):



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Darby proc. of recarburization, Thielen \* v 19 -91 *E & Min* July 5 \* Oct 25-90, Jan 17, Apr 18-91, and ed. *E News* \* Oct 18, 18 *Sc Am Sup* \* Nov 22-90; ingots and moulds handling in Bess. works, Curtis; Imperatori proc. expts. at Croton mag. mine, N. Y., Nau (full) *Am Min* \* v 20, 20 -92 *E News* Oct 17-91; mild, fusion of, Carulla *Cassier's* Feb -92 *Eng* Oct 23-91; recalescence in, E. Thomson *El Rev Lond* May 31-89 *El Wild*

*Eng* manganese-steel, Hadfield, Sep 7-21, dis., insets (full) *Inst C E* \* v 93 *Sc Am Sup* Apr 7-88; Brymbo works \* May 10; hydr. pressure treatment, Greenwood, 17; Firming Co., at Paris exhib. \* July 26; hardening and tempering of, Roberts-Austen, Sep 27, (full) *Sc Am Sup* Oct 26, behavior under stress, Carus-Wilson *Eng* \* Dec 13-89

*Eng* alloys, Riley, Jan 24 *Sc Am Sup* Mar 22; manuf., Galbraith *Eng* May 23; aluminum in, Keep, 23; cost, Wright, Aug 22-90; basic, ed. Jan 30; ordnance tests for, Anderson, May 15, 15 *Sc Am Sup* June 6 *The Eng* May 15-91; 10 years produc., Great Brit. Mar 11; basic expts., White (full) June 3, 3-92

*E & Min* metallurgy of, Howe (very full) Jan 14 - \* May 5, 19 \* June 9-23 \* July 7-21- Oct 6, 13, 27 \* Nov 3-17 \* Dec 8-22 -88, Jan 19, 26 \* Feb 9, 16 \* Mar 9-30 \* Apr 13, 20 \* May 11 -89, sup. (full) Jan, bk. review, June 28-90

*E & Min* steel making, cost in Ala., Phillips & Claghorn, Mar 2; compressing, Boulton ap., Crane \* May 18; basic Bess. proc. in U. S., Phillips, July 13-89; Bess. practice, curious, Howe, June 28, in Robert vessels, notes, Aug 30; open-h., novelties in procedure, Howe, Sep 13, Bess. proc. notes, do. \* Oct 4, how invented and perfected, H. Bessemer, 11-90

*E & Min* U. S. produc., census, Nov 3-90, '90, Jan 3; det. of carbon in, Blair, Apr 4; steel making in U. S. before 1810, Durfee, Nov 7 *Pop Sci* Oct; low, tests and experience (Prussia), Mehrrens report \* Dec 12-26-91, abs. *Inst C E* v 110 -92; basic, world's produc. '91, n *E & Min* May 21; steel billets cost, compar., U. S., Great Brit. and Europe, Oct 1; basic Bess. plant, Pottstown I. Co., Hartshorne \* Nov 5-19-92

*E News* direct proc. tests \* Jan 21; 20 years of open-h. experience, Koch, June 9-88; tests (Carbon I. Co.) Apr 6; drifting tests of structural \* 27, May 18; hydr. pressure treatment, Greenwood, July 6, dis., inset (full) *Inst C E* v 98 -89



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*Sc Am Sup* Aug 10 *The Eng* May 24; making in England *E News* Sep 7; soft, severe tests of \* 28; open-h. bridge manuf., Shed, Oct 5-89; testing, rate of speed in, Flint, Apr 19; mild, made by Thomas proc. 26; Henry Bessemer's story of invention of Bess. proc. Oct 18; Edgar Thomson works and blast furs. \* Nov 1; produc. 1880-90, Cens. bull. 8-90

*E News* hardening of surface, Haney proc. \* Oct 24-91; mild, for structural purposes, Henning \* Jan 2-16, Craighill cor. \* 30; soft, in bridges, Apr 2; soft, bending tests and proofs of qual., Kreuzpointner \* May 12, fire-box *R Gaz* May 27; cost *E News* \* July 28; open-h. and Bess. \* Sep 15-92

*E Rec* basic, expts. with, Aug 20; plate punching expts., Benjamin, Dec 24 *R Gaz* Nov 11-92 *J Assoc E Socs*; Bess. manuf., R. Hunt *F Inst* \* May -89; Robert-Bess. proc., Metallur. arts at Paris exhib., Garrison \* Oct -90

*Inst C E* open-h., use and testing for boiler-making, Goodall, discuss. (full) \* v 92; Terni works, Italy, ed. *The Eng* Nov 23, machin. of, Savage, insets *Inst C E* \* v 93; mild, effect of rolling and wire-drawing, H. Allen \* v 94 -88; Bess. proc. at Nischnje Saldensk, Ghurm-Ghrzhimailo, abs. v 100-90

*Inst M E* and steel guns, Chernoff, July 91; U. S. produc. '87 *Locom* Mar -88; phosphorus det. in, Dudley *R & Eng* \* Dec -92; bars, plain and twisted, rel. strength tests, Gilmore *R Gaz* Mar 15-89; cost and st. rails, Wright report, Feb 20; castings, good and bad, ed. \* July 24-91

*Sc Am Sup* at Glasgow exhib. Sep 15 *The Eng* July 27, Nov 2-88; heat treatment of, Howe (full) \* Apr 6-89; U. S. produc., Sweet, Nov 22-90 *Cens Bull* 18; aluminum-steel, Hadfield *Sc Am Sup* Apr 4-91; open-h. castings, Herrick, Mar 26 -92 *Iron Age*; domestic steels for naval purposes, Eaton (full) *Soc Arts Mass* -90; elastic limit momentary depression at two critical temps., Howe *Tech Q* Dec -88

*The Eng* Bess. converter controlling ap., Watts \* June 6; U.S. produc. Nov 14; basic open-h. manuf., Davis, Dec 19-90, dis. Jan 23; Dowlais works, at Cardiff, England \* Nov 13-91.

See also ALUMINUM-steel; IRON and steel; RAILS, steel, manuf.

**Steel trellis machine** *Eng* \* July 25-90

**Steel**, William H. *Inst C E* v 100 -90, 103 -91

**Stenotelegraph**, the Cassagnes, Chenut *El Wild* \* July 19-90

**Stephens**, Frederick C. *Inst C E* v 96 -89



- Stephenson**, Henry P. *Inst C E* v 101 -90
- Stereotyping**, quick proc. *Locom June Paper Wld, Sc Am Sup* Aug 4-88; Bolas (full) Oct 25 \* Nov 1-90, Feb 21-91
- Stevenson**, George W. *Inst C E* v 99 -90
- Stevenson**, Thomas *Inst C E* v 91 -88
- Stileman**, Francis C. *Inst C E* v 98 -89
- Stock** (quotation) printer, the Wiley *El Wld* \* Jan 14-88
- Stokers**, aut. conveyor *Eng* \* June 14, 28; Roney *Pwr* \* Aug *St R J* \* Aug -89. See also BOILERS, stokers; MECHAN. stokers
- Stollmeyer**, André B. *Inst C E* v 107 -92
- Stone**, Mason's stone-breaker *Eng* \* Nov 25-92; Gov't. contracts *E News* June 2; and cement, crushing strength, Baker, 23-88; cost of dressing, Cooke, Dec 13-90; cements and bld. material, method of testing resist., Durand-Claye *E Rec* May 11, abs. *Inst C E* v 95 -89 *An Ponts* \* v 16 -88; stone-cutting and quarrying by wire, abs. *Inst C E* v 95 -89; sawing machines, abs. v 106 -91; Ark. syenites tests, Wins *R & Eng* Jan -91; artificial 'Ferroid,' Poole *Sc Am Sup* Nov 8-90 *J Assoc E Socs*; circular saw *Sc Am Sup* \* May 2-91; artif. silica making, Aug 20-92. See also BLUESTONE; BUILDING stones; GRANITE; LIMESTONE indus; SLATE, etc.
- Stone**, Charles S., Raymond *Sc Am Sup* Mar 23-89 *E & Min*
- Stone**, Thomas W. *Inst C E* v 109 -92
- Stoneware**, adaptation to chem. ap., Rix *Sc Am Sup* \* July 25 \* Aug 1; manuf. Orton, Dec 19-91. See also EARTHENWARES, porous
- Storage** batteries, elec., or accums., Salom *Am Min* \* v 18 -90; Reckenzaun *El Rev Lond* Jan 6, June 22, July 6, 13, Aug 3, 24, Nov 9 *El Rev* Dec 1-88 *Sc Am Sup* Feb 2-89 *El Eng* Sep, Oct -88, Jan; litigation, Apr; defects of lead secondary, Duncan \* June *El Rev Lond* \* July 19, dis. (full) *E Wld* \* June 15-89 *El Eng* in train lighting, Brown, dis. July; regulating accums. in elec. lighting, methods, Prescott (very full) \* Nov, (full) *El Rev Lond* \* Nov 22, 29, Dec 6, (full) *El Rev* \* Nov 9, (full) *El Wld* \* Nov 9, dis. 23; chem. of, Frankland, Oct 25-89, Aug 22-90 *El Rev* Nov 2-89, expts. Sep 20-90 *Sc Am Sup* Nov 2-89, Nov 1-90 *El Eng* Nov, Dec -89 *El Eng* working effc. of secondary, Ayrton, Aug 13, (full) *El Rev Lond* \* July 18, 25 \* Aug 1. 8, (full) *El Wld* \* Aug 9-30 *E News* \* Sep 6; aut. reg. of accum. circuits *El Eng* \* Oct 1; Elec. Stor. Bat. Co's system \* 8-90



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*El Eng* chem. of, Ayrton \* Jan 7-91, (full) *El Rev Lond* \* Nov 28, Dec 5-19, (full) *El Wild* \* Dec 13-90; (second.) Robertson *El Rev Lond* Dec 11-91, (full) *El Wild* \* Jan 9-23, (full) *Sc Am Sup* \* Jan 23 *Soc Arts Lond*, *El Eng* Jan 13; Am., Donaldson-Macrae, n \* Apr 20-92

*El Rev Lond* (accums.) Waltenhofen, Oct 19, abs. *Inst C E* v 94 -88; Hoppe, bk. review, *El Rev Lond* Nov 30-88; alkaline accums. Jan 18 *The Eng* 18; sec. and secondary curs., Parnell *El Rev Lond* Feb 22; litigation, Apr 12; ed. May 10; traction, Bracken, Aug 30, Bell, Oct 18; at Paris exhib., Reckenzaun \* 25 *Sc Am Sup* \* Dec 14-89

*El Rev Lond* (accums.) management, Pumpelly, Apr 23, July 4 *El Wild* Apr 12, 26, May 31, July 14-90; in commercial work, index references to periodicals, J. S. Brown, Dec 5 *El Rev Lond* Dec 25-91; causes of changes of elec. mo. force, Gladstone \* May 27 \* June 3; chem. of lead accums., Darrieus \* June 10-24, trial, Aug 5; Epstein accums. tests, July 29; indus. accum. Nov 4-92

*El Rev* Mut. Elec. Mfg Co. \* July 20-89; gelatinous electrolytes for, Schoop, Aug 9 90; researches, Streintz, Jan 24 -91

*El Wild* machinery for manuf., Madden \* Oct 27-88; Bates, Feb 9; Preece (full) May 25; influence of density of acidulated water in, Paget, June 15; Dallas, July 13-89; elec. plants cal., Bracken's accum. diag. \* Nov 15-90; Frankfort exhib., Hering \* Nov 21-91

*Eng* accums. vs. transformers, May 25-88; *E News* \* May 25-89; power, cost, Kapp *E Rec* Mar 7; new accum. plate, Pike *F Inst* \* Apr 91; traction *R Gaz* Dec 30-92; *Sc Am Sup* Mar 2-89. See also R's, elec. storage bat.

ACCUM. Co. vs. N. Y. & Harlem R., decis. *El Wild* Apr 23-92

BRUSH, windmill accum. plant *El Eng* \* Dec 24-90; pat. July 29-91; legal decis. (full) *El Rev* Mar 29-90; suit, Aug 1, pats. 15-91; Flec. Accum. vs. Julien Coxe's decis. (full) *El Wild* Mar 30-89, Mar 29-90, Aug 1-91; effic., Higgins *Tech Q* \* Dec -87

DESMAZURES accums., Reynier, abs. *Inst C E* v 92 -88

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- LACOMBE bat. decision *El Wld* Nov 9-89
- LAURENT-Cely accum. *Eng* \* Mar 28-90
- MACRAEON'S *El Wld* Feb 9-89
- SCOTT-Sisling charging system *El Rev* \* Sep 26-91
- TUDOR accums. in cen. stations, Schoop *El Eng* \* Nov 16-92
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- Storms**, Am. tornado of *Eng* Mar 27, Apr 25-90; conditions causing tornado, Hazen *E Mag* \* Oct -91; meteorol., a contrib. to, Tatham *F Inst* June; hail-storm at Phila. Oct 1-89, Houston, Nov; and rain, Hazen *Sc Am Sup* June 15-89. See also RAINFALL
- Stoother**, John L. *Inst C E* v 104 -91
- Stoves**, effic., Lunge *The Eng* Sep 6-89 *J Soc Chem Ind.* See also GAS-stoves; MALT drying stove
- Strain**, Charles J. *F Inst* May -92
- Strains**, measurement of, Mallock *Eng* \* Nov 21-90. See also TESTING machines, etc.
- Street** railroads, Rap. Tran. Commiss. report to Mass. Legislature, Apr 5-92; stats., cens. bull. *El Wld* May 9; elec. cars speed in city sts., Hewitt \* Dec 19-91; accidents, N. Y. city, ed. *E News* Mar 10-88, inc. in, ed. July 11-91
- E Rec* and pavements, Stayton, Dec 3-31-87, Jan 7, 21, Feb 4, 25, Apr 7, May 26, June 9, 16, Oct 13, Dec 8, 29-88, Apr 13, June 8, 15, Aug 3, Sep 14, Oct 5, Dec 7-21-89, Jan 4-90; Fairchild, bk. review, Aug 20-92; elec., in cities (extent) *R & Eng* Nov -90 *El Eng*; cost of op., cens. bull. *R Gas* May 22; sociology of, Cooley, Oct 23; and steam, rel. value, tables, Mansfield *Soc Arts Mass* -91, (full) *St R J* May -91
- St R J* taxation, W. Smith, Nov -88; conductor's way-bill \* Apr -89; horse trams, Fairchild (full) \* Oct \* Dec; public and state treatment of Co's, Nov -90 *Scribner's*
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GREAT Brit., and tramway working, ed. *Eng* June 22-88; England, cost of traction *E News* Oct 24; and Ire. *St R J* May; Great Brit. & Ire. Tramways Inst. Aug -91

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*Sc Am Sup* Connelly gas motor \* Oct 6, *The Eng* \* Sep 30 -92, *St R J* \* Sep -88; motors other than animal, cable and elec., Winsor report, Nov *St R Gaz*, *Sc Am Sup* Nov 16-89; Rowan's motor for cheap traction \* Jan 9-92; compressed air propul. Chester \* Apr 26 *The Eng* \* Mar 21-90; first principles *St R J* \* May; elec., finan. conditions of success, Barr report, Nov -89; steam, air and gas trams, Fairchild (full) \* Jan; mo. power, a standard of comparison, Hampton \* Mar -91. See also CABLE R's; COMPRESSED air motors; GAS motors; R's, elec.



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**Strike**, cost of a, C. B. Q. R. *Eng* June 28; London laborers, ed. Sep 6-89. See also LABOR

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**Struggle** for existence, ed. *Eng*? Feb 10-88

**Struts**, strength of, McCabe cor. *R Gas* \* Apr 22-92

**Stubbs**, William H. *Inst C E* v 102 -90

**Submarine** mines, Bucknill *Eng* Nov 28, Dec 5-90. See HAR. eng

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**Sugar**, works, Auckland, New Zeal. *Eng* Feb 3-88; machin. imps. *E & Min* \* July 5-90; sorghum, indus., Cowgill report *Sc Am Sup* \* Feb 18; beet and indus., Gehring (full) Sep 29-88; chemical, July 20-89; manuf. in Cuba, July 26; synthetical expts. in sugar series, Fischer, Sep 13-90 *Am Chem J*

*Sc Am Sup* sugars, standards for polarimetric es. of, U. S. report, Crompton \* Oct 3; making by diffusion proc., Stubb's report \* 24; sugar items, Dec 12-91; cane, juices class., Deeming, July 16; Demerara produc., 20 years imps., Bellairs, Sep 24-92; cane, influence of temp. on spec. rotation of, det. by Polariscopes, Andrews *Tech Q* May; sugar mill rollers *The Eng* \* Nov 29-89

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**Sulphur**, dioxide, De V. Wood; expt. det. of latent heat of, Jacobus *Am M E* \* v 12, 12-**91**; deposits of So. Utah, du Faur *Am Min* July -**87**, abs. *Inst C E* v 92-**88**; mines of Sicily, duration of, abs. v 91-**88**, Carroll report *E & Min* Sep 1, 8 *Sc Am Sup* May 26-**88**; spec. resist., Monckman *El Rev Lond* Dec 28-**88**

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**Sun**, solar radiation intensity, compar. with elec. arc, Langley *El Eng* \* Jan -**90**; sun-dials for low latitudes, Cumine *R & Eng* \* July -**91** *Sc Am Sup* \* Feb 4-**91** ?; discov. of platinum, Hutchins, Jan 14; distance and constitution, June 2; energy util., Weston's ap. \* Dec 15-**88**; solar surface in last ten years, Perry, Sep 21-**89**; sunheat and sunlight, Rogers, June 14-**90**; a great magnet, Hiscox \* Aug 20; total eclipse, 1893 \* Dec 3-**92**; photog. of solar prominences, Hale *Tech Q* Nov -**90**. See also ASTRON; SOLAR

**Sun** motor, Ericsson *R & Eng* \* Sep *Sc Am Sup* \* Sep 15-**88** *Nat.*

**Surveying**, N. Y. State, final results of triangulation of, Weed, Parsons, Albany, '87, bk; bench marks, expts. on stability of, Cooley, dis. *Am C E* v 20-**89**; deep rock cuts, method of taking cross-sections in, by triangulation, Watkins, insets \* v 22-**90**; imaginary boundaries, Raymond *Am Min* \* v 18-**90**; photographic, and co-ordinate, Stanley (full) \* v 20-**92** *E Rec* \* July 2-**92**; the ordnance, methods and proces., Wilson *Eng* Feb 27-**91**; U. S. Geolog., costly, Wolcott *E Mag* Nov -**92**

*E News* New Jersey state survey, Apr 14; transit field notes keeping, best method, cor., ed. Sep 29-**88**; plotting contours. Lorini, cor., diag. \* Feb 28; making topog. relief maps, cor 23: resurvey of So. Amboy, N. J., Hill \* Apr 13; traverse, Bassell cor. \* Dec 7-**89**



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*E News* field-books, notes, Rothwell, Apr 5; acreage table for comput. right of way areas, June 14; grades at st. intersections, cor. \* 21; Brit. ordnance, Oct 18; prob. \* Nov 1; the Porro telescope for stadia work, J. B. Johnson \* 8-90; Roanoke, Va. \* Jan 9 \* June 23; field sheet for topog. work \* July 28; surveyor's qualifications, Gov't. Cape Col., So. Africa, Aug 4-92

*E Rec* how to tell a good instrument, Lietz, Apr 11; St. Louis, Mo., topog. Oct 8-91; topog. methods, K. Allen \* Feb 6-92; Tacheometry, or rapid, Brough *Inst C E* \* v 91; plane-table, econ. use in topog., Pierce, dis., inset (full); chaining, imp. systems, W. Thompson *Inst C E* \* v 92, 92-88

*Inst C E* Hawaii, Windward, prelim. in new countries, Gribble; rapid, Topham; in Australian colonies, Vickery, v 95-89; by vertical angles, probable errors, Airy; triang. errors, short method of distrib; France, leveling, Jimels, abs. \* v 101, 101-90 *Genie Civil* v 17-90

*Inst C E* land, astron. as applied to, Downes \* v 108; spirit leveling of Switz., Messerschmitt, abs. v 109-92 *Schweiz Bauz*; Italy, geodetic map *R & Eng* \* Nov-88; France, geodetic work, Aug-89; prob. \* Dec-90; hand telescope for stadia-work, Richards *Tech Q* \* Apr-92. See also INSTRUMENTS; TUNNEL surveying

**Swallow**, James S. *Inst C E* v 101-90

**Sweet**, John E., por. *Cassier's* \* Apr-92

**Switzerland**, stat. *E News* Aug 3-89

**Sylvanite** mine, Col. *E & Min* \* Dec 15-88

**Sylvester**, James J., por., Cayley (full) *Sc Am Sup* \* Apr 13-89

**Szegedin**, Town of, reconstruction (after flood), Stübben, abs. *Inst C E* v 92-88

**Tabulating**, elec., Hollerith system, com. report *F Inst* \* Apr-90; statistical tab. by machinery, Pidgin *Soc Arts Mass*-89. See also CENSUS taking

**Talc** *E & Min* May 25-89

**Talking** machine. See PHONOGRAPH

**Talman**, James J. *Inst C E* v 110-92

**Tank** sluice with equilib. valve, Larmunie *E News* \* Feb 14-91



**Tannin**, chestnut wood bark, Trimble *F Inst* Oct -91, May -92

*Sc Am Sup* Nov 14-91

**Tanning**, elec., Worms & Bale ap. *El Eng* \* Nov 26; creosotic acid employment in, Hauff *Sc Am Sup* May 3; anal., Muter \* Sep 6-90; materials of Europe, May 23; by aid of electric., Rideal (full) \* Aug 8-91; plants capable of yielding materials, Mafat, Oct 8-92; applic. of alpha-sulphonic acid of naphthaline to bating and puring of hides, Burns *Tech Q* July -91; theory and practice, Salomon, Apr -92. See also ELEC.—

LEATHER tanning

**Tarbotton**, Mariott O. *Inst C E* v 91 -88

**Tar** furnace, Anderson *Sc Am Sup* \* Feb 11-88

**Tariff** and the constructive arts, Thurston *Cassier's* Jan -92

**Taxes**, U. S. *E News* June 1-89

**Taylor**, John *Inst C E* v 109 -92

**Teaching** of science, com. report (full) *Sc Am Sup* Jan 25, Feb 1-90. See also SCHOOLS; SCIENCE

**Technical** Soc. of Pac. Coast, Geldern, pors. *Cassier's* \* Oct -92

**Telegrams** and storms, Slingo *El Rev Lond* Jan 23, 30, Feb 6-20-91

**Telegraph** *El Eng* wire, hard drawn cop., durabil., Maver, Apr -88; line adjust., Delany \* Dec *El Rev* \* Nov 30 *El Wld* \* Apr 27 \* Nov 30, multiplex, new sys., Patten's (full) *El Eng* \* Mar-89 \* June 18; circuits, Jones' main office \* Dec 17-90; writing tel. \* June 8-91

*El Eng* mod. Am. ap., F. Jones \* Mar 30, May 25 \* June 22 \* July 27 \* Aug 3, 17; wire joints, breaking strain in hard drawn cop., Jones, June 1; type, the Am. n \* July 27; cable, Burke relay and transmitter \* Dec 7-92

*El Rev Lond* R. survey system, Gilbert \* May 18; transmiss. limit, Moon, Aug 10; submar. cables and ocean temps., Bright, Nov 16-88; cables, of world, Feb 15; Siemen's recording ap. for compact Morse writing \* Mar 8; Submar. Co. 29; ocean probs. and conditions, Apr 5; trans-atlan. cable routes \* Aug 2, map *El Wld* \* July 27; high vs. low speed, finan. compar. *El Rev Lond* Aug 16, Linckens *El Rev* Sep 7; cable manuf. early hist. *El Rev Lond* Dec 13-89

*El Rev Lond* submar. cables, aut. reversal signaling on \* Feb 7; protection, lightning guards, Lodge \* May 16-80; elec. curs. in conductors, Bennett \* July 25; sub. cables, interrupts. and repairs, '88 89, table, Aug 22-90; prog., '96, Feb 6, in England,



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Preece, Sep 18; sub. cables, India-rubber core in \* Mar 20; pictorial \* Dec 4-91; ap. constants, Moon, Apr 29; sub. cables, double differential relay, Raymond-Barker \* July 22-92

*El Rev* hist., Vail May 5 *Century* Apr -88; cables, broken ocean, Oct 5; multiple, synchronism in, Morse, Nov 16; cable manuf. hist., Barrett, 23-89; tournament (fast sending) \* Apr 12, 19; curs. in conductors, obs., Bennett \* Aug 23; writing, prins. of, Morse \* Nov 15-90

*El Rev* and telephone, inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; and pat. stats., Brit. *El Rev* June 27; musical, Hachenberg, por. \* Nov 14; a pub., Hale, Dec 5-91 *Cosmopol.*; in Am. *El Rev* Feb 20-92

*El Wld* dynamo-elec. machines in, West. Un. bld., Maver \* Feb 11, 18; quadruplex, imps. do. \* May 19, 26 \* June 2, cor. \* Oct 27; trans-pac. cables, proposed, table, July 14; Gray telautograph \* Aug 11; with pulsatory and undul. cur. sigs., Maver \* 25 \* Sep 8, 22 \* Oct 6; and telephony, Jacques' simul. system \* Nov 17-88

*El Wld* ocean probs. and conditions, Weatherbee \* Jan 26; imperfect earth in circuits, phenom., Kenelly \* Mar 16; line construct., Paris exhib. \* Nov 9-89; quadruplex, Healy \* Jan 18; submar., Webb (full) Mar 1, (full) *Sc Am Sup* Apr 19; fast sending contest *El Wld* \* Apr 19; signaling across rivers, India, Melhuish \* May 10; nationalizing, Wiman, Dec 30 -90

*El Wld* electric., galv., mag. and teleg., chron. hist., Mottelay (very full) \* Apr 18-Dec 26-91, Jan 2-Feb 27, Sep 3, pors. \* 10-Oct 22-Dec 31 etc. -92; the phonopore, Langdon-Davies *Sc Am Sup* \* May 18 *The Eng* \* June 21-89 *El Wld* \* Mar 7; and teleph. indiv. selection on elec. circuits call sys. \* July 11; Gov't., Rosewater (full) Dec 12, Gov't. control, Foote, 19 -91

*El Wld* pictorial, Trotter \* Jan 16; the Wentz line adjuster, Rosenbaum \* Feb 20; lines earth cur. disturbs., Finn \* May 14; cable relays, Judd \* Nov 5-92; multiplex, the phonophore *Eng* \* Apr 19; at Paris exhib. \* Aug 16, 23 \* Oct 11, Post Office, Oct 25, Nov 1-89

*E News* the Am. inventors of the, ed. Apr 14, birth of the elec. 21; the Finley helio-teleg. 28-88; trans-Atlan. cable lines \* Mar 29; the world's lines, Oct 25; cables, internat. sys., Henricker, 25-90



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*F Inst* the writing, Gump, Oct -88; cable, Delaney \* July, (full) *Sc Am Sup* \* Aug 31 \* Sep 7-89; foreign curs. balancing effects, Fletcher *Inst C E* \* v 94 -88; sub. cables resist. measurement, Rouillard, abs. v 95 -89; sub. Pac. cable, projected *Locom* Nov -91; Gill-Alex. indiv. call *R Gaz* \* Mar 13; secret service indiv. call \* Aug 28-91

*Sc Am Sup* Morse and first line, Feb 25-88; trans-atlan. cable lines \* Apr 26-90; transmiss. of messages through the air without wires, Trowbridge \* Feb 21; between Great Brit., Europe, Am. and the East, Niven \* Mar 28; first message, Vail, Nov 14-91; of to-day, Buckingham *Scribner's* July -89

CHINA, and R's, Hitchcock *E News* \* Nov 17-92

DELANY's sys. of private line *El Eng*\* July 20-90; aut. *El Wld* \* Feb 2; line adjusting *R Gaz* \* Nov 1-89

EUROPE, Gov't. tels. of, Rosewater *El Eng* Dec 9, dis. 16; Niven *Sc Am Sup* \* Mar 28-91

MERCADIER multiplex sys., abs. *Inst C E* v 106 -91

PARIS-New York Co. *El Rev Lond* July 29-92

PATTEN's multiplex sys. *El Wld*\* Jan 26, (full) \* Feb 23, dis. Mar 9-89

POSTAL, Brit. Post Office *El Rev Lond* Apr 5-89; *El Rev* Dec 5, Gov't. control, Rosewater, dis. (full) 12; Great Brit. sys. *The Eng*\* Dec 18-91. See also POSTAL telegraph

SPECTRO-tel., Dresing *El Rev Lond*, *El Wld* \* July 21 *Sc Am Sup* \* Aug 4-88

STENOTELEGRAPH, the Cassagnes (stenography at a distance), Chenut *El Wld*\* July 19 *Sc Am Sup* \* Aug 16-90

TYPE printing, Wright & Moore's *El Rev Lond* \* Mar 1 *Sc Am Sup* \* June 8-89 *Iron*

WESTERN Union Co., U. S., reports *El Eng* Nov -88, Dec -89, N. Y. equip. (full) Jan 27-92; reports *El Rev* Oct 19-89, Oct 22-92

WEST Indies, competition map *El Rev Lond* \* Dec 26-90

**Telegraph** Engr. Soc. pro. *El Rev Lond* Jan 13-27, Feb 3, 17, 24, Mar 2-16, 30, Apr 20, 27, May 4, 18, 25, June 18; *Eng* May 25-88

**Telegraphophone**, the Wheless *El Wld* \* Sep 14-89

**Telemeter** system *El Wld* \* Sep 21-89; Fiske's (marine dist. instrum.), Brylinski, abs. *Inst C E* v 106 -91 \* *An Telegr* -91; Gautier's pocket (rapid dist. measuring), Robbins *Tech Q* \* May -89



**Telephone** *El Eng* transmitting speech by interrupted elec. curs., Kintner \* Jan *El Rev Lond* \* Jan 20, 27; and electric light and power circuits, elec. relations, Lockwood *El Eng* Oct -88; interference cases (very full) Mar; induced cur. strength with magneto-teleph. transmitter, Cross, May -89

*El Eng* induction \* Jan; eng., Carty, May 21 *El Rev* May 24; spec. induc. capac., Jacques *El Eng* Oct 1-90; inductive disturbs. in circuits, Carty \* Mar 25, dis. Apr 15 *El Rev Lond* Apr 10 *El Rev* \* Mar 23, *El Wld* \* 28, dis. \* Apr 11 *Sc Am Sup* \* May 9, expts., Kennelly *El Eng* \* May 6, 13-91; signals, selective or indiv., Lockwood \* June 8 *El Rev* \* June 18 (full) *El Wld* \* 11; eng., Webb *El Eng* \* Sep 7; connecting stations with exchange office by single line, Zetsche \* 21-92

*El Rev Lond* batteries, Pickernell, Oct 19 *El Rev* Sep 15-88; telephony, Hibbard *El Rev Lond* Oct 18; induction, Carty \* Dec 6, dis. *El Rev* \* Nov 30 *El Wld* \* 30 *Eng* \* Dec 20-89; French *El Rev Lond* Jan 10; exchange construct., Pickernell, Oct 17-90; receiver, influence of strength of magnet in, Cross \* Feb 20; telephoning great cities, Bennett (full) \* Sep 4, 11, 11, ed. Oct 2, 18, Nov 18 *Eng* \* Sep 11; and telegraphy, prog. in England, Preece *El Rev Lond* Sep 18-91; domestic telephs. \* May 13-27-92

*El Rev* limits of speaking teleph. lines, Wietlisbach, May 18; Paris exhibit, Sargent, Sep 21, convention, 21; Enzmann's telephonic relay and phonopore \* Nov 2-89; principles underlying acoustic telephony, Cross, Feb 8; convention (full) Sep 20; Co's corporate organization, Hall, 20; Root's (box) aut. pay station \* Nov 22-90; the McCluer toll-box \* Jan 24; telephony, new method of study, Cross, Feb 7; and telegr., inventors of, Gray addr. Apr 18 *El Wld* 25 *E Mag* June 20 *Sc Am Sup* 20; first exchange, New Haven, Ct. *El Rev* Jan 2; ten years with, Barrett \* Feb 20-92

*El Wld* telephony, Touanne, Sep 14-89, duplex, Oct 23-86, Jan 4-90, Barrett \* Jan 18; submar. cables for long dist., Preece, Oct 4-90; disturbs., Kennelly, Apr 11-91; U. S. indus. June 18; Co. operating, Foote, July 9-92

*E Mag* chat with Europe, Webb, Apr -91; indus. future, do. Mar -92; teleph.-equation, Madsen, abs. *Inst C E* v 95 -89; effects, intensity and equality, Mercadier, abs. v 108-92; elec. boxes *Sc Am Sup* \* Jan 21; interferences of dynamo curs., McCluer, Oct 13-88; telephone girl, Nelson, Feb 20-92



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- Tech Q* magneto transmitter, strength of induced cur., Cross \* Feb -89; magneto receiver, influence of strength of magnet, do. \* Nov -90; telephony, studies in Rogers lab. of physics, Mass. Inst. Tech., do. *Soc Arts Mass* -89; new method of study in, do. -91
- ALBANY, Hudson river Co. *El Rev* \* Dec 10-92
- AM. Bell Co., report *El Eng* Apr, decis. May -88; reports *El Rev* Apr 7-88, Apr 6-89, Apr 5-90, Apr 11-91, Apr 9-92; U. S. vs., pat. decis., law (full) *El Wld* Mar 24, 31, (full) *El Rev* Mar 31, May 5 *Sci Am* Nov 24; reports, Apr 7-88, Apr 6-89, Apr 11-91
- BELL's water-jet transmitter, Tunzelmann *El Wld* \* Aug 11 *Sc Am Sup* \* Sep 8-88
- BERESFORD, the *El Rev Lond* May 27, June 10-92
- BOSTON exchange *El Rev* \* Aug 1-91
- COLLIER audible *El Wld* \* July 18-91
- DENVER, induction and interference with service *El Eng* Apr 16 -90; system *El Rev* \* Feb 9-89
- DETROIT Exchange Assoc. *El Eng* Sep 17-90
- EDISON's carbon pats. *El Rev* \* May 14 *El Wld* \* 14-92
- GRAMOPHONE, Berliner *El Eng* \* Dec 31-90 *El Wld* \* Jan 3-91. See also GRAMOPHONE
- HOWARD's ap. *El Rev* \* Oct 31-91
- JACQUE's sys. of simul. telegr. and telephony *El Wld* \* Nov 17-88
- LONDON-Paris, Eng. Channel submar. line, Preece *El Rev Lond* \* Aug 28; Webb *El Rev* Mar 28, Apr 11, Preece \* Sep 26 *El Wld* \* Oct 3; *Eng* Mar 20, Preece, Sep 4 *Sc Am Sup* \* Oct 3 -91 *El Eng*
- LONG distance, 950 miles, Dickson *Cassier's* \* Nov; Webb (full) *El Eng* \* May 4, 11; N. Y. - Chic. line, eng. details, Wetzler \* Dec 14; 1,000 miles by, N. Y. - Chic., pors. *El Rev* \* Oct 29; Neilson *El Wld* July 9; *Sc Am Sup* Jan 9-92; *Locom* May -88 *El Rev*
- MICROPHONE, evolution of, Tanner *El Wld* \* Dec 13 *El Rev Lond* \* Nov 21; transmitter, excursion of electrodes, Cross, Oct 31 *Tech Q* Aug *El Rev* Nov 1-90 *Tech Q*; Blake contact expts., Patterson *El Rev* May 5 *Tech Q* Feb -88; Barrett *El Rev* Mar 19-92; transmitter, Berliner pat. (full) *El Wld* \* Nov 28, 28-91; cur. strength, Sabine. Cross *Tech Q* Feb -89. See also MICROPHONE



**Telephone**, NAT. Exchange Assoc. pro. *El Eng* Oct (full) *El Rev* Sep 15-88; *El Rev Lond* June 7-89; (full) *El Wld* Sep 15-88, Sep 21-89, Sep 20-90

NEW England Teleph. & Telegr. Co. reports *El Rev* May 18-89, May 17-90; quarters *El Wld* \* Aug 1-91

NEW York city, service *El Eng* \* Sep 10-90; underground wire work *El Rev* \* Mar 16-89; Met. Exchange \* Sep 13-90, station *Sci Am* Mar 30-89

PHILA. Bell Co. plant (full) *El Eng* \* Feb 10, report, Apr 6-92

PULSION, the *Eng* \* Dec 6-89

ROSEBRUGH duplex system *El Wld* \* Jan 4-90

SWEDEN & Norway *El Rev Lond* Aug 1 *Eng* Dec 12-90

SUTTON's system *Sc Am Sup* \* Feb 28-91

SWITCH-board, Vail & Seely's *El Rev* \* July 14-88, McClure's multiple \* Feb 21-91; switching, Wordingham, inset *Inst C E* \* v 100 -90

UNITED Co., an. meeting *El Rev Lond* July 6-88, report, June 7-89

VAN Size's exchange system *El Wld* \* Dec 8-88

**Tele-photography**, Sutton *El Rev Lond* \* Nov 7-90

**Telescope** grinding machine, Common's 5-ft. mirror (full) *Eng* \* Oct 28 \* Nov 4, 11; inset, 18, 25-92

**Telescopes**, hand, for stadia work, Richards *Am Min* \* v 20 -92 *E & Min* \* May 14 *Sc Am Sup* \* June 11-92; object glasses *Sci Am, Eng* \* Jan 6; for stellar photog. \* Apr 27; astronom., clock driving ap. for, Grubb \* Oct 5 *The Eng* Aug 10-88; hist., Holden *Sc Am Sup* Jan 21; Manchester exhib. \* 28; great, of world, Rees, Mar 3-88; pyrometric \* Mar 1-90; Lick equatorial 36-in., Keeler *The Eng* July 6-88

**Telpherage**, two rope haulage systems, Norris *Am M E* \* v 12 -91 *E & Min* \* Aug 8, 15; aerial wire ropeways, Pohlig, inset (full) *Am Min* \* v 19 -91; cable transfer for R. cars, Spilsbury \* v 20 -92; and elec. R's of Edinb. exhib., Manville *El Rev Lond* Oct 17-90

*El Rev* elec. transport., Parcelle \* Aug 9; double track elevated elec. wire road, for mining and mills *El Wld* \* Jan 4-90; Sprague elec. aerial tramway *E & Min* \* July 28-88; Lidgerwood suspen. cableway, Ogden mines, N. J. \* Oct 10-91 *E News* the Portelectric carrier, May 25-89; Suspen. Transport. Co., Chandler's pat. wire ropeway \* July 12-90; Plomo-



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sas wire ropeway, McIntire \* Mar 21 *Sc Am Sup* \* Feb 21 *R Rev* the Garrucha aerial, Spain \* July 25 *R & Eng* \* Aug *Industries*; suspen. cableway at Austin dam, Tex. *E News* \* Nov 14-91; long span wire rope, Howland, Me. \* Apr 2-92

*Inst C E* Gourjon system wire ropeways, Gros, abs. v 93-88 *An Ponts* \* v 14-87; Beer system, Raoult, abs. *Inst C E* v 95-89 *Rev Mines* v 3-88 *Sc Am Sup* \* Dec 15-88; Ayrton, Perry, Jenkins', at Glynde, England, Fernald *Pop Sci* \* July-90; wire rope transport. and transmiss. *R Gaz* \* Oct 7-92

*Sc Am Sup* Otto pat. wire ropeway (full) \* June 22-89, Gottesegen coll., Silesia, *The Eng* Dec 28-88, inset \* Jan 25 \* Feb 8, 8-89; Ry., elec., Fdinb. exhib. \* July 11 *Sc Am Sup* \* Aug 30-90; aerial, Landun sugar works, France \* June 13-91. See also ELEC., Portelec; ROPE driving; WIRE rope

**Tempel**, William, Schiaparelli *Sc Am Sup* July 13-89

**Temperatures**, at various depths, L. Cochituate, Boston, diag. *E News* \* July 26-90; absolute zero *R Gaz* Sep 30-92. See also EARTH temps; THERMOMETERS

**Tennessee** and Ala. *Eng* \* Oct 5 \* Nov 2-88

**Tesla**, Nikola, por. *El Wild* \* Feb 15-90, and his business *Sc Am Sup* \* May 21-92

**Testing** machines, aut. recording ap., Gray *Am M E* v 13-92 *Cassier's* \* Oct-92; the Emery, Towne *Eng* \* May 11-25, 75-ton, inset \* July 6, dis., insets (full) *Inst M E* \* May, Oct, at Watertown arsenal *The Eng* Jan 20-88

*Eng* Kennedy's 50-ton laboratory \* Sep 12 *The Eng* \* July 18-90; hydr., 1200 tons capac., Phœnix I. Co., inset *E News* \* Jan 10; the Olsen and com. report *F Inst* \* Feb; alternative-center, Walker eng. lab., Liverpool, Hele-Shaw, insets *Inst M E* \* July-91

**Testing** materials, uniform methods, com. report *Am C E* v 26-92; and sampling works, St. Louis *E & Min* \* Feb 11-88; standard methods *E News* Mar 7, Aug 22; Kirk system, Hunt, Sept 19-91; Malines Gov't. works, Belgium, Roussel *Inst C E* \* v 91-88; metals, influence of time in, Bauschinger (full) v 107-92; Charlottenburg station, Germany *R & Eng* Aug-90; labs., Master Mech's com. report *R Gaz* June 26-91; repeated stress, expts., Sondericker *Tech Q* \* Apr-92. See also BEAMS; CAST iron; MATERIALS, inspection; STEEL, expts.



- Texas**, geological survey *E & Min* Apr 5-90
- Theatre**, Terry, Court and Garrick, structural ironwork in, London *The Eng* \* Feb 1-89
- Thermic** motor of the future *Sc Am Sup* \* Apr 25-91
- Thermo-dynamics**, difficulty, Mansel cor. *The Eng* Nov 1, n 15-89, Bower cor. \* Aug 5, Sep 23 \* Dec 2-92
- Thermograph**, Draper's *Eng* \* Feb 14-90
- Thermometers**, mercurial, expts. to det. rate of rise or fall, Nagle *Am M E* \* v 13 -92; new scale, Forbes *E Wld* Oct 12-89; correcting *Locom* Dec -88, Jan; Browne (full) *Sc Am Sup* \* Sep 14-89; calibration method at many points, Holman *Tech Q* \* Sep -87
- Thermo-motor**, the Hargreaves *The Eng* Jan 27; and heat engines, R. H. Smith, Feb 3-88
- Thomas**, Edward C. G. *Inst C E* v 99 -90
- Thomas**, Sidney G., bk. review *E & Min* Aug 8-91
- Thompson**, Silvanus P., por. *El Wld* \* Jan 9-92
- Thomson**, Elihu, por. (full) *El Wld* \* Sep 1-88
- Thomson**, James *Sc Am Sup* July 9-92
- Thomson**, William, por. *El Eng* \* Jan 13, por. *El Wld* 16-92, por. (full) *Sc Am Sup* \* Mar 9-89
- Thorman**, Edward H. *Inst C E* v 109 -92
- Thrashing** machine trials, Doncaster *The Eng* \* June 26, July 3, 10-91
- Thurston**, Robert H., por. *Cassier's* \* Nov -91
- Tide** gauge, aut. self-registering, n *E News* \* July 28-88
- Tides**, tidal volume, d'Auria *F Inst* \* Apr, law of variation \* May; range in rivers and estuaries, Gieseler, Aug -91; the bore of the Tsien-tang-Kiang, Moore *Inst C E* \* v 99; continuous util. of tidal power, Decoeur, abs. v 102 -90 *Genie Civil* v 17 -90. See also WAVE motors
- Timber**, expan. due to water absorption, De V. Wood *Am M E* \* v 10 -89; preservation, ed. *Eng* Nov 21-90; use in eng. structures, Apr 1-92; mine tim. preserv. *E & Min* May 30-91; supply vs. R. consumption, Fernow *E News* Oct 25; preserv., Chanute, Dec 13, report (full) *R Gaz* Dec 12-90 *Sc Am Sup* Feb 14, treatment *The Eng* Sep 11, creosote for, Jan 31; Gov't. tests, J. B. Johnson, Nov 28-91; preserv. *E Rec* Dec 20 -90
- Inst C E* expts., want of uniform system, Campbell, abs. v 92; creosoting in New Zeal., Sharp \* v 93 -88; in tropics, the



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teredo *Navalis* and White ant., James, v 103 -91; pine, strength *R & Eng* Apr -92; preserv., Reed *R Gaz* Sep 19, creosoting (full) Dec 26-90; Am., scientific study of, J. B. Johnson \* Dec 4-91; and some of its diseases, Ward (full) *Sc Am Sup* \* Mar 17, 24 \* Apr 7, 28 \* May 5 \* June 2 \* July 28 \* Sep 1, 22, 29-88. See also MATERIALS, strength; WOOD

**Time**, uniform standard, com. report *Am C E* v 26 -92 *R Gaz* Mar 29-89, Jan 29-92; and cost, short way to keep, Binsse *Am M E* v 9 -88; correct, Pritchett *El Eng* July 2-90; elec. distrib. of, A. D. Brown *El Rev* June 30 *F Inst* June, July, (full) *Sc Am Sup* Aug 18-88; Mayrhofer's system *El Rev* \* July 5-90; standard, Gov't. system, Gardner, July 30 *El Wld* July 2-92

*E Mag* old-fogy methods of reckoning, Fleming \* May -91; standard of, 24 o'clock system *E News* \* Aug 17-89; correct, simple method of keeping *Locom* Nov -88; standard and 24 hour sys. *R & Eng* May -89, uniform, May -92; convention *R Gaz* Apr 12-89, pro. Apr 11; new notation, Richardson *Sc Am Sup* \* Jan 11-90. See also R's, time convention

**Time** checking machine, the Llewellyn *E News* \* Nov 16-89

**Tin**, assay, influence of Columbite on, Carpenter *Am Min* v 17 -89 (contin. p 785); ores, dry assay, Hofman, v 18 -90 *Tech Q* May, Aug -90; alluvial deposits, Siak, Sumatra, Rolker (full) n p 772 *Am Min* \* v 20 -92; tin and the tariff, Fletcher *Bost Traveller* Oct 3-88; produc., ed. *Eng* July 18-90; world's store, Claypole *E Mag* \* Jan; tin plate indus. and English exports, n Mar -92 *Industries*

*E & Min* Dakota mines, Sep 15-88; mines, Malinon \* Aug 31; in No. Car., Ledoux cor. Dec 14-89; produc. Aug 30; San Jacinto mines, Cal., Benedict, Oct 18-90; in '89 Jan 4-90, in '90, Jan 3; in cen. Tex., Comstock, 24; tin plate manuf., Garrison, abs. Feb 28-91 *F Inst* Dec -90; recov. from tin plate scrap, new method, Schultze, abs. *Inst C E* v 102 -90 *E & Min* Mar 28; Bolivia mines, Minchin, May 16; U. S. tin plate indus. Dec 12-91; market, '91, Jan 2; ore concen. plant at Harney Peak, So. Dak. \* July 30, mines do. Nov 26, Dec 3-92 *E News* Am. mines, Emmens, Nov 24-92; produc. *Sc Am Sup* Aug 9-90; sources of, Merrill, Nov 28; hist. of discov. and use of, Flower, Dec 5-91

**Tin** plate cleaning machine, Davies' *E & Min* \* June 27-91



- Tires**, Munton proc. manuf. steel, Chic., inset *Eng* \* Oct 17-90
- Tobacco**, use of, anal. (effect) Bosworth *Sc Am Sup* Apr 27-89;  
(effects) Rochard, Sep 10-92 *Pop Sci*
- Tools**, cast iron, for cutting metals, O. Smith *Am Min* \* v 19-91
- Torey**, Hamilton *Inst CE* v 98-89
- Tornadoes**, in U.S., Hazen, notes *E News* Apr 12-90. See also STORMS; WIND
- Torpedo** boats, the Halpine *El Rev* \* Oct 19; Sims-Edison fish \* Nov 16; Peral submarine, Webb *El Wild* Oct 19-89; Fatum, Italian, inset *Eng* \* Jan 20 *Sc Am Sup* \* Feb 25; 2d class, Yarrow *Eng* \* Apr 27-88; Donaldson, Feb 22; Spanish trials report, Mar 29, Apr 12, 19; seaworthiness of, Hovgaard, July 26; Ital. navy \* Dec 6; Brit. navy \* 20-89; Sunderland, b. with petrol. fuel, indic. diags. inset, \* Jan 10, Mansel cor. 24, (full) *Sc Am Sup* \* Feb 22; Yarrow's, Dec 20 *Eng* \* Nov 21-90; Brazilian navy, sea-going \* Sep 18-91  
*E News* the 'Cushing,' trials, Jan 2; U.S. navy, inset \* May 12-92; English *R & Eng* Feb, Mar; Nordenfelt submarine \* May *The Eng* Mar 16-88; Ital. navy *R & Eng* \* Feb-90; Baker submar. \* July-92; French, No. 110 *Sc Am Sup* \* May 4; No. 1, structural strength, Drake (full) \* June 29 \* July 6, correction, 18-89; Nibbio, Ital. \* Feb 1-90 *The Eng* Mar 30-88; standard, Sep 20-89; Turkish Gov't. \* Jan 10; Tartar class \* Nov 14, ed. 21-90; French \* Jan 30-91, July 15-92
- Torpedoes**, the Howell locomotive *The Eng* Aug 17 *Eng* \* Jan 20; Berdan system \* Feb 3; Grenfell, ed. Apr 27; tor. attack, Jaques, Dec 21-88; the Victoria \* Aug 29 *Sc Am Sup* \* Oct 11; Whitehead & Howell aut., Ellicott *Eng* \* Nov 14, 28 \* Dec 19, 26-90 *The Eng* \* Aug 7-21; Sims-Edison elec. *Eng* \* May 1-91 *Sc Am Sup* \* May 3-90 \* Mar 5-92 *The Eng* \* Dec 18-91; Canet, discharge tubes (full) *Sc Am Sup* \* Sep 21-89 *Genie Civil*; marine locom. *The Eng* Feb 24-88; the Lege \* Apr 12-89
- Torpedo** placing machine, the Fox *R & Eng* \* Feb-92
- Torpedo** thrower, aerial, Graydon air gun *Sc Am Sup* \* Dec 15-88
- Towers**, Egyptian, light, Minneap. exhib. *El Eng* \* Sep 17-90; Judson, 1600 ft. *Eng* \* Nov 15-89; London, great, proposed, ed. May 2-90; iron, Frankfort Elec. exhib. \* Aug 21; U.S. Columb., Chic., Morison's 1120 ft. \* Nov 20 \* Dec 18 *E News* \* Dec 5-91 *R & Eng* \* Jan-92 *R Gas* \* Dec 4-91



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*E News* Lathing observ., N. Y., Crystal Pal. exhib., 1853, Nov 23; Douglass har., Isle of Man, Dec 7-89; braced iron, cor. \* June 21-90; wind strains in, graph. det., Steiner \* Mar 21; leaning, proposed, Halpenny cor. \* Apr 25; Hastings proposed, Columb. exhib., cor. Aug 1-91

*E Rec* water tower, Pullman, Ill. \* Dec 28; church spire framing and anchoring \* Jan 12-89, steeple \* Dec 20; London great, designs \* May 17, 24, prize \* July 5, Shaw's proposed \* Aug 23; iron clock tower construct. \* Dec 6, prize designs *R & Eng* \* Aug -90; U. S. Columb. exhib. n *R Gas* Oct 23-91; tower of Babel, Kircher *Sci Am Arch ed* June -88

*Sc Am Sup* London great, proposed, designs \* June 7, 1250 ft., Davey \* July 19-90; Proctor steel, U. S. Columb. ex. \* Apr 4, oscil. beam, proposed, O. Smith \* May 30; Lond. Eiffel, Maxwell & Tuke design, n \* Aug 8-91 *Bld News, Industries*; Lond., designs, 1320 ft. *The Eng* \* May 2, 1550 ft., Ende, 1300 ft., Woodcock, Fairfax \* 9, 9, 1250 ft., Davey \* 23 \* June 6, 1400 ft., R. H. Smith report \* 29, 1200 ft. Stewart (prize) \* 27, 1300 ft., Webster, 2d prize design \* July 4, 1300 ft., Graham \* Aug 15-90. See also CHIMNEYS; MONUMENTS; STAND-PIPES

EIFFEL Paris, 1000 ft. *El Wld* \* Apr 20; copyright, ed. *Eng* Apr 12; (full) \* May 3, compared with Forth br. \* 3; elec. plant \* June 21; lifts \* July 5-19; *E & Min* \* Feb 2; inset *E News* \* June 8-89; *E Rec* \* Dec 15-29-88 \* Apr 13 \* May 18, 25 \* June 1-89; pressure gauge, Nansouty, abs. *Inst C E* v 105 -91 *Genie Civil* \* v 18-91; lifts, Ansaloni, insets *Inst M E* \* July; *R & Eng* Mar; top of *Sci Am* Mar 9; *Sc Am Sup* \* Apr 27 \* June 15 \* July 6, 27; top of *The Eng* \* Jan 4-18, hydr. elevators, Roux \* Mar 22 \* May 10-89

**Towns**, new (boomed), failures in, Fleming *E & Min* \* Feb 13, 27, Mar 19, 26, Apr 2, 16, 30, May 21, 28-92

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*E News* N. Y. Cen. standard stone ballasted road-bed \* May 19; English, Tratman, July 7, Cunningham (Soc. pro.) Mar 16; the Servis tie-plates, 16, the Stuart \* Apr 27; imp., Tratman \* 27, July 20; track laying, cost, May 25; Dudley's inspection diags. \* June 15; Goldie & Fennerty's grooved spikes, holding power \* Nov 23-89

*E News* the Davies steel lock spike \* Apr 19; positive nut-lock, Jeffersonville, O. \* Sep 6; maintenance, Reed \* Aug 30, Hall, Dec 13; Bush interlocking bolts \* 20-90; B. & O. standards and rules \* Oct 31; rail section, So. Austral. Gov't. R. \* 31; spikes, tests of various forms, Cox, Dec 5-91

*E News* Young reversible nut-lock \* Apr 16; Haarman (German), bk. review, July 28; protect. against torrents and earth-slides in Sicily, Italy \* Sep 15; Prussian St. R's \* Nov 17-92; German & Austria-Hungary R's per. way, W. Worthington, abs. *Inst C E* v 95 -89; double gauge, 3-rail turnouts for, Geddis (full) *R & Eng* \* Apr - July -92

*R Gaz* car wheels, axles and, N. E. R. Club dis. Feb 17; per. way, circular returns, Apr 13; mainten. (cost), Goodwin, May 4, Curtis \* Nov 16-88; stone ballast in India, May 8; Am., English and Indian practice, notes, Oct 11; track work, Nov 8-89; Jones safety nut lock, n \* Oct 3-90; longitud. bearings for, T. C. Clarke, May 29-91; N. Y., New Haven standard \* Jan 1; tie plates, Sandberg \* Mar 25; nut locks \* Nov 11-92. See also CROSSTIES; R's, curves — spikes — switches — U. S. construct; RAILS, joints — sections

**Track** jack, the Fisher duplex, n *E News* \* Aug 30 *R Gaz* \* Sep 5-90

**Traction**, det., h. p. of tabulated constants, Crane *El Eng* Nov 19-90

**Traction** engines, England, descr. and construct.. Fletcher *E News* \* Oct 27, ed. Nov 10, and steam road rollers, 10, \* Dec 1 -92; spring wheel *The Eng* Dec 7-88. See also ROAD engines; STEAM carriage

**Trade**, England and Am. relations, McCormick, ed. *Eng* Apr 8-92; Am. and foreign exports and imports *E News* Apr 14-88

**Trade**-marks, law of, Sebastian, bk. review *Eng* Dec 19-90

**Trade** schools, N. Y., work in, Mead *E Mag* \* Apr -92; J. Wil-son *F Inst* Feb-Oct; N. Y. *Sc Am Sup* \* Dec 20-90

**Trade** unionism, new and old, Howell, bk. rev. *Eng* May 1-91



**Trade-winds**, cause of, Velschow, dis., insets *Am C E* \* v 23 -90

**Tramways**, Guinness' brewery, Georghegan *Eng* \* Oct 12, insets *Inst M E* \* July -88; the Hunt industrial *E News* \* June 18 -92; tramway wagon with steel rails, Wells, descr. *Lehigh Eng J* Apr; steam, for country districts *The Eng* Oct 26, Nov 16-88. See also R's, elec; STREET R's.

**Trans-Caspian territory**. See R's, Trans-Caspian

**Travertine deposits**, Mammoth Hot Springs, Yellowstone Park, Weed *E & Min* \* June 13-91

**Trellis machine**, steel *Eng* \* July 25-90

**Trench brace**, Dunn extensible *E News* \* July 7-92

**Trestles**, and pile structures, Western Am. R's, inset *Eng* \* May 20-92; C. B. & N. standard plans *E News* \* Apr 7, May 5, June 9; round timber, Burnt Br. creek, Vancouver, Klickitat & Yakima R., Habersham cor. \* 9; Norfolk & W. stand. plans \* 23; special features in wooden, cor. July 21; design of, ed. 21 -88

*E News* timber, for R's., Palmer, July 13; Cleve. & Canton frame \* Nov 2; Wheeling & L. Erie timber \* Dec 7-89; 24° curve on R., Paddock \* May 10-90; Can. Pac. designs \* May 2-91; pile bridges, cost of repairs, Talbot *E Rec* Sep 20-90; and scaffolding, Ziegler's sys., com. report *F Inst* \* Aug -88; R. trestle work, Jameson (full) *R & Eng* \* Dec -89 \* Jan -90

*R Gaz* safety of pile bridges, Apr 26-89; wooden bridges, Foster, Or. & Wash. Ter. R. \* Apr 25, Ft. Worth & Den. City stand. \* May 30, St. P. & Man. \* June 13, 27 July 18 Aug 1, 22 Sep 5, 19 \* Oct 31 \* Nov 21, 28 \* Dec 5, 12-90 \* Jan 2, 30 \* Feb 13; Esquimalt & Nanaimo high \* Feb 6; Minneap. & St. L. pile and, Hixon cor. \* Apr 17; Intercol. R. of Can., deep water \* Oct 2; Halifax har. do., pile \* Dec 25-91. See also BRIDGES, floor-beams and pine stringers, Bates — pile; PILING;

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**Trickett**, John *Inst C E* v 95 -89

**Trigonometer**, Leschorn, diag. *E News* \* Nov 24-88

**Trigonometry**, graphical, Foster *E News* \* Aug 31-89

**Triple thermic motor**, Haswell *The Eng* June 1-88. See also THERMIC motor

**Trobe-Bateman**, Frederick F. *Inst C E* v 90 -89

**Trowbridge**, William P. *Am M E* v 13 -92, por. *E & Min* \* Aug 27, por. *Sc Am Sup* \* Nov 19-92



**Trusts**, and the law, C. Brown *El Eng* June 25; Am. and English, ed. *Eng* Aug 29-90

**Tubes** and tubing, rolling from solid bars *F Inst* Dec *Locom* Dec *Sc Am Sup* Dec -90 *Am M E* v 8 -87; flexible metallic, Almond \* v 12 -91 *Eng* \* Jan 16-91 *E & Min* \* Dec 6 *E News* \* Nov 15-90 *R Gaz* \* Nov 15-89 \* Nov 28-90 *Sc Am Sup* \* Jan 10-91 *The Eng* \* Oct 18-89 \* Dec 30-92; spirally welded steel, Bayles *Am Min* \* v 16 -88, v 19 -91 *E & Min* \* Apr 7, 14-88 *E News* \* Mar 30-89 *F Inst* \* Feb -88, abs. *R & Eng* \* Mar -89 *Sci Am* June 16-88 *Sc Am Sup* Nov 8-90 *Eng*

*Eng* flexible metallic, Cammell's \* Oct 11-89; seamless tubes rolling, F. Siemens \* Sep 21 *Sc Am Sup* \* Nov 10-88; the Hartz tube welding machine *E & Min* \* June 21; Mannesmann seamless pipe molding proc., Wedding, June 14, Dec 27, weldless, manuf. *E News* \* Aug 2 *F Inst* Dec, rolling proc., Siemens *Locom* Dec -90 \* Jan -91 *Sc Am Sup* \* Mar 24 \* May 12-88, Gordon *The Eng* June 27-90

*E News* manuf. of copper by electricity, Elmore's Aug 9-90; spinning, shaping and welding metals, Bevington's proc., com. report *F Inst* \* Nov -91; spiral weld machin. development, Green, inset \* Mar -92; manuf., Robertson cor. *The Eng* Sep 28-88; tube making machin., Baraclough \* Oct 23-91. See also PIPES

**Tug boats**, Kathleen screw, inset *Eng* \* Jan 31 *Sc Am Sup* \* Mar 8-90; Noordzee & Oostzee screw *The Eng* \* Sep 2, 9-92

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*E News* rock, bottom vs. top heading in, Kahnbach \* Mar 24; Can. Pac. R., sections, T. Thomson \* Nov 24-88; suba-



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*E Rec* Mil. flushing (sewer) \* Dec 8-88; arch, shield for removing, Caled. R. \* May 7; tunneling in loose ground, Vyrnwy aq., Deacon, abs. Aug 27 *The Eng* 19-92; ventil., three Alpine, Pürzl, abs. *Inst C E* v 106-91; relining, in use, the Saulzaie, Libeaux, n *R & Eng* \* July -89; tunneling under heavy pressures, Schenck *R Gaz* \* Apr 10 \* May 8; ventil. of, ed. Oct 30-91. See also BLASTING; EXPLOSIVES; MINES and mining; R's, underground; SEWERAGE and sewers, Brooklyn main relief; WATER-works, N. Y., Croton aq. excav., etc.

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BETCHWORTH, Dorking, Lond. & Br. R., repairing *E News* \* Apr 20, Lopes *Inst C E* \* v 95 -89

BIG Bull, Norfolk & W. R. *E News* \* June 9-92

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CROTON aqueduct, N. Y., surveying on Div. 6, Watkins, dis., insets *Am C E* \* v 23 -90; excav. through soft ground, Carson *E & Min* \* Apr 25-91, *The Eng* \* Oct 24, 31 \* Nov 7-21 -90



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ENGLISH Channel tubular, proposed, Reed *Eng* Aug 28-91; ed. *E News* Oct 25-90

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HUDSON river *Eng* Oct 17-90; *E News* Oct 5-89; shield for \* Mar 15 \* July 19; segment erector \* Nov 15; cast iron lining \* Apr 12-90, ed. June 16-92; *R & Eng* \* July; Burr *R Gas* \* Mar 14-90; *Industries*

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LOCUST mt., Pa., immense mine *E News* Aug 2-90

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- SEINE R & Eng \* May -**91**
- SEVERN, Walker, bk. n *Eng* Nov 30-**88**; Richardson *E Rec* June 4, 11, July 2-**92**
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- STAMPEDE or Cascade, No. Pac. R., McHenry *E News* \* June 30-**88**; Hobart \* Oct 3, 10, (full) *Sc Am Sup* \* Nov 7-**91**
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- WASHINGTON aqueduct *E News* May 4, 11-**89**
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*E Mag* devel. of South, Atkinson, July; reform in pub. works, Haupt, July -91; our costly geolog. survey, Wolcott, Nov; indus. devel. in South, Edmonds, Oct - Dec -92; exports and imports, '86-7 *E & Min* Feb 18, lessons from, Aug 11; mint, need of a better, July 14, report, Dec 8-88, work and needs, June 1, Leech report, Nov 9, 9; Interstate commerce act (full) Apr 20, 27-89

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*E News* center of pop., 1790 - 1890, map \* Mar 7; pat. system, past and present, ed. Apr 18; receipts and expenditures of 100 cities, July 4; Pacific slope, growth and resources, ed.



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*F Inst* Geolog. survey, broader field for Frazer, Sep -88; Life-saving service, Piper, Jan *Sc Am Sup* Feb 6; growth of the Federal Power, Nelson *Harper's M* July; families and dwellings, census, Wright *Pop Sci* Aug -92; naval prog. *R & Eng* \* Jan - Mar \* June \* July, Sep - Nov; mineral products, Day, Sep -88

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**Utah**, So., sulphur deposits, Faber du Faur *Am Min* v 16 -88

**Vacuum**, motors, Paris exhib. *Eng* \* June 14-89; pan, Manlove \* Dec 21 *Sc Am Sup* \* Feb 4-88; pump, the Beacon, for exhausting incand. elec. lamps *El Eng* \* Mar 4-91, Berrenberg's do. *El Wld* \* Apr 26-90. See also PUMPS, vac.

**Valve** gears, Edward's (launch engine) *Eng* \* Dec 30-92; Rand's mechan. air *E & Min* \* Apr 12-90. See ENGINES—LOCOMS—PUMPING engines, valve gears

**Valves**, details, Nat. W-works Co., Sickels, inset *Am C E* \* v 24 -91, and air chamber *E Rec* \* Sep 19-91; Freeman's balanced (engine) *El Wld* \* Sep 6-90; and hydrant manuf., Chapman V. Mfg works *E News* \* Sep 15-88; Rand mechan. air \* May 11-89 *E & Min* \* Apr 12-90; 24-in. water, loss of head due to, Kuichling *E Rec* Mar 5-92; Lunkenheimer Brass Co. novel straightway *R Gaz* \* June 6-90. See also ENGINES, valves



**Vancouver City** *Eng* July 12-89

**Van Depoele**, Charles J., por. *El Eng* \* June 25-90 *El Rev* \* Mar 26-92

**Van Zandt**, Ferdinand S., por. *E & Min* \* Aug 15-91

**Vapor** engines, and vapors, saturated and superheated, formulas for, properties, De V. Wood *Am M E* \* v 10 -89, effc. of, do. \* v 12 -91; volatile, Yarrow *Eng* Apr 6-88. See also HOT air engines; STEAM

**Varley**, Samuel A., por. (full) *El Rev Lond* Sep 9-92

**Vawser**, Robert *Inst C E* v 99 -90

**Vehicles**, draught of, cor. *The Eng* Dec 25-91, Brigg \* Feb 26, Mar 4-92

**Velocity**, of falling bodies, in water, Richards *Am Min* \* v 18 -90, insets *Tech Q* \* May -90; measurement of sound *The Eng* \* June 17, Aug 26-92

**Velocity** registering ap., Odograph, Marey *Sc Am Sup* \* May 10 -90

**Venezuela**, vs. Great Brit., Bullman *E & Min* Mar 24; coal, asphalt and petrol. deposits *Sc Am Sup* Aug 11-88

**Ventilation**. See HEATING and ventilation

**Vibrations**, universality of, Haskins *Sc Am Sup* Dec 29-88

**Vickers**, George N. *Inst C E* v 96 -89

**Victoria**, New So. Wales, gold fields *Eng* \* Jan 3, 17, 31, Feb 14, 21, Mar 7-90; colony *Sc Am Sup* \* Oct 26-89. See also MINERALS; R's, Victoria

**Vignoles**, Hutton *Inst C E* v 100 -90

**Village** communities, second summers, Going *E Mag* \* Apr -91

**Vivian**, Johnson, por. *E & Min* \* May 2-91

**Voice** ap., Piltan's (for studying) *Sc Am Sup* \* Feb 11-88

**Volcanic** eruption, Sho-Bandai-San *Sc Am Sup* Jan 12-89

**Volta**, Alessandro, Bell, por. *El Wld* \* Sep 5-91

**Vote** counting, elec., Goaziou, abs. *Inst C E* v 92 -88

**Vulcanizing** press, explosion of *Locom* May -89

**Wadsworth**, Marshman E., por. *E & Min* \* Nov 28-91

**Wakeford**, John *Inst C E* v 95 -89

**Walker**, Benjamin *Inst C E* v 105 *Inst M E* Apr -91

**Walker**, John, Groves, por. *Cassier's* \* Oct -92

**Walker**, Thomas A. *Eng* Nov 29-89 *Inst C E* v 100 -90

**Walker**, T. U., Mason *F Inst* Nov -88

**Wallace**, David *Inst C E* v 100 -90



**War**, mod., the civilian electrician in, Fiske *El Eng* Oct 29 *El Rev Lond* Nov 14 *El Wld* Nov 1 *E News* \* Sep 20, 27 *Sc Am Sup* Sep 20, 27 *El Rev* Nov 1-90; electric. in, Parkhurst, Dec 17-31; war 100 years hence, Gautier *E Mag* May -92; art of, Mercur, bk. rev. *E & Min* Dec 28-89; the Kriegsspiel in Am., Livermore *Soc Arts Mass* -90; French disappearing turrets *The Eng* July 20-88; H. M. S. Blenheim \* July 11; war material, Paris exhib., report \* 25-90. See also EXPLOSIVES; GUNNERY and armor; MILITARY eng; NAVIES (war ships)

**Ward**, David *Inst C E* v 93 -88

**Warden**, William M. *Inst C E* v 103 -91

**Wardlaw**, James R. *Am C E* v 26 -92

**Waring**, Charles H. *Inst C E* v 91, 92 -88

**Waring**, Herbert F. *Inst C E* v 95 -89

**Waring**, Thomas *Inst C E* v 104 -91

**Warships**. See NAVIES

**Washing machine**, Twelvetreets' rotary *The Eng* Feb 3-88

**Washington**, D. C., st. imps. *E News* Oct 27-88. See also  
MUNIC. eng; PAVEMENTS; SEWERAGE; WATER-works, etc.

**Waste forces of nature util.**, Preece *Sc Am Sup* June 18-92

**Watch**, compens. balance non-mag., Paillard's, Houston *F Inst* \*  
Mar; cleaning and repairing *Sc Am Sup* Sep 22-88

**Watchman's clock**, Eco-magnetic, White *Soc Arts Mass* -89

**Water**, friction waste and loss in mains, Brush, *E Rec* July 14, dis., insets (full) *Am C E* \* v 19 -88; flow, effect of inc. of supply to a stream, Francis, dis; supplies purity and fresh water algae, Rafter, dis., insets (very full) \* v 21, 21 -89, abs. *Inst C E* v 101 -90; density at different temps., Nagle, diags. *Cassier's* \* Sep *Am M E* v 13 -92; storage in Ariz., results, Blake; impurities of, A. Hunt *Am Min* v 17, 17 -89; flow through pipes *Cassier's* Nov -91, *Airy Eng* \* Jan 4, 11-89, Feb 13 *E Rec* Feb 28-91; flowing, util. of energy of, Purdon *El Rev Lond* Aug 12-92

*Eng* charges by measure and assessment, ed. June 20, ed. *E News* July 28, 28-88; ground, influence upon health, Latham *Eng* Aug 28-91; pollution and epidemics, Rafter *E Mag* May; impure and pub. health, Davis, Dec -91; Passaic river, chem. and san. inves., Wurtz *E & Min* Mar 22 \* Apr 12-26-90; tandem hoisting tanks, self-loading and dumping, for flooded slopes, Bowden \* Nov 7 *Am Min*, *E News* \* Oct 17 *E Rec* \* 10-91



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*E News* evap., depth of, in U. S., map \* Dec 29-88, Russell, Jan 5; Lond., organic matter in, com. report, Apr 6; self-recording rain gauges, value of, Weston, May 4, 4; wt. of, Dec 28; settlement, Seddon \* 28-89 \* Jan 4, clearing by \* Feb 1-90; consumpt., U. S., and use of meters, Jan 16; flow of in pipes, E. Atkinson, Apr 2; potable, micros. exam. of, Rafter, June 16; nat. aeration, Drown, Aug 25; flow over dam, formula, Frizell \* Sep 29-92

*E Rec* Miss. river, Smart report, Feb 11; flow through pipes cal., Murphy, Aug 11-88; flow in open channels and pipes, Manning, Mar 29 *The Eng* Jan 24; rates schedules basis, Tubbs *E Rec* May 31; cost in various cities, U. S. Oct 18-90

*F Inst* Venturi tubes, new forms \* Apr; potable, rapid colorimetric method of det. nitrates in, Hooker, June; compressed, dilatation of, Amagat, Sep, Dec; spheroidal state of, Gossart, Dec -89; water ram in pipes, Church \* Apr \* May -90; anal., local standards in, Haines, May; artes. well, anal., do. June; anal., ammonia proc. of, do. June; drinking and disease, notes, Mason \* Nov -91

*Inst C E* flow, expts. with submerged ajutages, Clark, abs. v 91; Spree river, changes in passage through Berlin, Frank, abs. v 92; deep waters, penetration of light in, expts., abs. v 94 -88; qualities of potable, abs. v 95 -89; running, util., Internat. Congress, Paris, '89, Boemches, abs. v 101 -90; flow in earthen channels, Sadler, inset \* v 103 -91

*Sc Am Sup* Hungary bitter waters, Aug 4-88; a glass of water (bacteria in), Kean \* Apr 20 *Tech Q* \* Feb; water colors, action of light on, W. Russell *Industries, Sc Am Sup* July 27 -89; molecule, Ganswindt, Oct 3-91; wt. of, Jan 25; surface waters (legal definition), Feb 22, Mar 1, 8-90 *Am Law Rev*; chem. exam. of drinking, Drown *Soc Arts Mass* -88; chlorine in normal, Mass. State Bd. of Health map, do. -91

*Tech Q* potable, det. of nitrates in, Grandval & Lajoux's proc., Fox, Sep -87; surface waters, odor and color, Drown, Feb; anal., loss of ignition in, do. \* Dec; biolog. exam. of, Sedgwick, Oct -88 *Soc Arts Mass* -90; det. of organic nitrogen in, Kjeldahl method, Drown *Tech Q* Feb; number of bacteria in, Jordan, May -89, and algae, do., Sedgwick, Feb; carb. acid det. in, Hazen \* May -90; solids det. in, do. Apr; drinking, alum in test for, E. Richards, July -91; difficulty with which



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it parts with its dissolved oxygen, Gill, Oct -92; supply in So. Africa *The Eng* Jan 20-88; induced currents, ed. \* Feb 15-89; flow through hose and nozzles, see FIRE streams, W-wks. AQUEDUCTS, the Nadrai, India *Eng* Oct 23 -91; of Zempoala, Mex. *E News* \* July 7; Croton, bad work on, ed. \* Oct 13, 13, McBean, cor. 20-88; Kali Nadi, Ganges canal failure report *E Rec* Apr 13-89. See also WATER-works

COMPANIES, a London, remarkable hist. *E News* Aug 17; London Co's., n Nov 2-89; franchises of, Jan 7-92; and consumers, legal relations, Denman *E Rec* Dec 31-87. See also under WATER-works

DISTILLING ap., Pamphlett & Ferguson's *The Eng* \* Nov 8-89  
EJECTOR, Miller *E News* \* Aug 4-88

FILTERS, efficacy of for drinking water, bacteriolog. study, Currier, insets *Am C E* \* v 24 -91; Hyatt system *Eng* \* Nov 9, Long Branch, N. J. *E News* \* Oct 13, com. report *F Inst* July -88; mechan. filtration, Austen *E Mag* Apr -91; expts., Berlin, Frankel & Piefke *E News* June 21, mechan., ed. 21-90  
*E News* Nat. plant, Terre Haute, Ind. \* Feb 7; filter gallery washing, Eureka, Cal. \* Apr 11; the Warren \* Oct 31 *The Eng* \* June 19-91; filter bed, Raton, N. Mex., proposed *E News* Apr \* 16, Holland \* July 28; Lond. & N. W. R., Crewe \* Sep 15-92; filtration practice, Tomlinson *E Rec* June 2-88

*Inst C E* filtration, prins. involved in produc. of pure water, Piefke, Berlin water-works, bk. n, abs. v 92 -88; softening and filtering ap. for locoms. at Penarth Dock station, Cardiff, Taff Vale R., Pullen, inset \* v 97 -89; sand filter beds, Piefke, abs. v 102 -90, flow water in *An Ponts* Mar -90; filtration of natural waters, Drown *Sc Am Sup* Nov 1-90 *J Assoc E Socs*; Crenothrix, Sedgwick *Soc Arts Mass* -91; data of, do. (full) *Tech Q* Nov -90; the Torrent filter *The Eng* June 8; revolving, at Dordrecht, 29-88. See also WATER purification

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GATE, the Parker aut. *E News* \* July 13-89; aut. waste-gate, Foote \* June 21-90

INDICATORS, water-manometer and anemometer, Silliman *Am Min* \* v 17 -89; water-level indic. and recorder, Barr & Macwhirten's elec. *Sc Am Sup* \* Jan 20-89 *The Eng* Dec 14-88; recorder of quan. and vel. pumped into Alexandra dock, Hull, Hurtzig \* Oct 3-90



**Water METERS**, the Venturi, Merriman, dis., Herschel, inset *Am C E* \* v 18 -88 *E News* \* July 7-92 *E Rec* \* Nov 10-88 \* June 25-92, abs. *Inst C E* v 93 -88; waste and loss in mains, Brush, insets *Am C E* \* v 19 -88; proportional, adapted to measure discharge of nozzles, J. Thomson, dis., inset \* v 24; the nozzle as an accurate, Freeman, dis., insets \* v 24 -91; Schonheyder's positive *The Eng* June 15 *Eng* \* 15; Tylor \* Sep 21; Bonnas \* Dec 7-88; Ahrbecker's \* Jan 30; Sporton's registering \* Dec 18-91

*E News* tests, Boston, Feb 25; Prov., R. I. system, Weston, Aug 11-88; the Frost and consumption of water per capita, Feb 9-89; who should own the meters, June 21; rates, U. S. and Can., table, ed. Aug 9, 16-90; consumpt., U. S. and use of meters, Jan 16-92; use of, Tubbs *E Rec* May 23-91; rules Madison, Wis., May 21; sale by, Berlin, June 4-30; Thomson proportional \* July 30-92

*Inst C E* sale by, in Berlin, Gill, dis. (very full) \* v 107 -92; elec. ap. for water measuring, Lowe *Soc Arts Mass* -88; Tylor's *The Eng* \* May 3; the differential positive \* May 17-89; the Frager \* Apr 24-91

**MOTORS**, the 'Demon' *Eng* \* Aug 28 *The Eng* \* Oct 9-91; extended use of, Rodda *E News* Feb 9; and dynamo, the Belknap \* June 15-89; cost and econ., S. Babcock, Apr 25 *E Rec* May 9-91. See also **WATER-wheels**

**PIPES**, flow in, Weston, dis., insets (full) *Am C E* \* v 22 -90; loss of head through 24-in stop valve, Kuichling, insets \* v 26 -92 *E Rec* Oct 8-92; cast iron coated, specs., Yardley *Am Min* v 18 -90; cleansing, Swiney *Eng* Apr 13-88; corrosion, Horsfall cor. Aug 22-90

*E News* action of Boston water on, W. Nichols, Feb 25; Cal. redwood, laying \* Apr 28; head in ft. nec. for different vels. of discharge, Brush, July 7-88, Gould \* Feb 16, 23, Mar 2-23; cement-lined, Feb 16; 6-in. flex. joint \* May 18; economic head for long, R. Brown \* Oct 5-89; welded steel, making, Cartwright proc. Apr 5; cast iron, cost, Weston, tables for es. June 21, 28-90

*E News* tapping branches to, device for \* Jan 24; cement-lined, wrt. iron vs. cast iron, 31; cast iron coated, specs., Yardley, com. report \* Apr 18 *E Rec* May 9; riveted steel, Duncan (full) \* May 9 *E News* \* Apr 25 flex. joint, Liverpool \* Aug 22, 5-ft., for submerged pipe \* Oct 17; large siphon, McKinney



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lake and Miss. river \* Nov 28; wooden staves mains, Hawks \* June 13-**91**, Apr 28-**88**, May 12-**92**

*E News* bridge and 48-in main, Wash., D. C. \* Feb 13; new method of laying large submerged \* Mar 19, lowering submerged, Platte river, Denver \* Apr 28; protection crossing bridges, S. Babcock \* May 19; distrib. mains and fire service, July 21; cast iron cement joints, May 5 \* Sep 8-**92**

*E Rec* draining and filling, Russell, Dec 24-**87**; arched main over stream, Geneva, N. Y. works \* June 6; service pipes discharge, diag. and formula, Prov. \* Nov 7-**91**; 4-ft., laying, Brooklyn \* Nov 5-**92**; action of water on galv. iron, Nichols *J Assoc E Socs*, abs. *Inst C E* v 92-**88**; suspended across Sarine river, Friburg, Switz., abs; cast iron, specs., com. report, abs; steel riveted, Duncan, abs. v 107, 107-**92 Am W W Assoc report; 5-ft., Lavergne *Genie Civil* \* v 19-**91**; detection of leaks in, notes, Francis *The Eng* July 18-**88**; tunnel, flex. joint steel pipes, Vyrnwy to Liverpool \* June 5-**91**. See also PIPES**

POWER, and steam, compar. cost, Manning *Am M E* v 10-**89**; value of a, Main v 13; prob. in, Richards v 13-**92 Cassier's** May-**92 E News** Jan 24, Dec 5; elec. util. of, Buell *E! Eng* Apr 8 *Sc Am Sup* May 16-**91**; Carter *E! Rev Lond* \* Aug 19- \* Nov 4-**92**; plant at Gokak, India *Eng* \* June 8-**88**; expts. on, Aug 28-**91**; in N. Eng., S. Webber *E Mag* \* July **91**; computs. worked out by slide rule, Cox *E & Min* Jan 9-**92 Pwr** \* Feb, Mar, June \* July \* Sep \* Dec-**91**

*E News* of N. Jersey, Cook report, Jan 5; Holyoke, Mass. June 1; Lowell, Mass. 1; Mass. practice, Fitzgerald, May 25, June 16-**89**; Niag. River Co. \* May 17, 24, Niag. Falls Co. \* Nov 8; Sault Ste. Marie, July 12; elec. light station, Keswick, England, inset \* Sep 13-**90**; Austin, Tex. Aug 18-**92**; hydraulics, Hiscox *Sc Am Sup* \* Feb 7, 14, 28 \* Mar 7, 14 \* Apr 25-**91**. See also NIAG. Falls power util.

PRESSURE regulator, the Kieley *E News* \* May 4-**89**

PURIFICATION, self-purif. of flowing (biolog. study) Currier, dis., insets *Am C E* \* v 24-**91**; by iron, ed. *Eng* Nov 2-**88**; revolving river purifier, W. Anderson, Aug 21-**91 E News** Sep 22-**92**; Davis *E Mag* Mar-**92**; contam. of, in storage reservoirs on Pac. coast and palliatives *E News* \* Aug 23-**90**; by metallic iron, Devonshire *E Rec* Feb 14 \* *Soc Arts Mass* -**91**,



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inset *Tech Q* \* Apr -91 *F Inst* \* June -90; sep. of iron compounds and removal of sulphuretted hydrogen, Kaerber, abs. *Inst C E* v 92 -88; Leeds *Sc Am Sup* Dec 26-91; drinking, Austen, Oct 15-92. See also WATER filters

SOFTENING, plant, Southampton, inset *Eng*\* Mar 11; for locoms. *E News* \* June 9-92; Davis *Sc Am Sup* June 29-89; *The Eng* Feb 3, 10-88; Maigneu's ap., Birm. \* Aug 22-90

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TOWERS, Yonkers, N. Y. *E News* \* May 19-92; the Norton, Vyrnwy aqued. \* Oct 10 *The Eng* \* Sep 18-91. See STAND-PIPES

VALVES, 24-in stop, loss of head from, Kuichling, dis., insets *Am C E* \* v 26 -92; 48-in stop, Croton aq. *E News* \* Dec 15-88; opening indicator, Chapman Valve Co. \* Dec 7, new stop valve \* 21-89. See also VALVES

WASTE, Rochester, N. Y., restricting, Rafter, dis., insets (full) *Am C E* \* v 26 -92; and prevention, metering and min. rates, Brush *E News* Aug 25-88; and charges, various cities *E Rec* Jan 11-25, Feb 1-90; and prevention, Hope *Inst C E* \* v 110 -92

WHEELS, the Pelton impact motor *El Wld* \* Jan 4-90 *E & Min* \* Mar 7-91 *E News* \* Feb 20, Cazin cor. \* Dec 22-92 *R & Eng* \* Oct -90 *The Eng* \* Feb 27 \* July 17-91; ancient and mod., S. Webber *E Mag* \* May \* June; jet *E Rec* Mar 14 -91; Richards *R & Eng* Sep -92 *Am M E*

**Waters**, J. H. E., por. *E & Min* \* Aug 22-91

**Water-works** and supply, compar. of supply systems from a finan. point of view, Fitz Gerald, dis. *Am C E* v 24 -91 *Inst C E* v 105 -91, table *Sc Am Sup* July 4-91; gravity systems, Rafter *E Mag* \* Feb; supplies for cities and towns, Davis \* May -92 *E News* treatment and sources, Fanning, Apr 28; conduits, use of salt glazed vitrified pipe in, Am. W-wks. Assoc., Babcock dis. 28; sub-surface waters for cities, Breneman, May 19; reservoir walls, proper cross-section for, Cain \* June 23-88; of far West, ed. Apr 20; records, Diven, 27; U. S. and Can. 27, May 4-89, embanks. and dams, inset \* June 21, for Am., ed. July 12; exam. of, Aug 16-90; obtaining filtered water from rivers, Lefort sys. \* July 18; sources. suggestions as to selection of, Stearns, diags. \* Nov 7; of U. S. & Can., ed. 28; growth, U. S., ed. Dec 5, 12-91; franchises, Tubbs, May 19; dissolved oxy-



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*E Rec* aerating nat. canals and low dams, Babcock \* June 30  
*Sc Am Sup* July 14-88; for small towns, Billings *E Rec* Mar 30; records, Glover, July 20; supply and fresh water algae, Rafter, 27, Aug 3 *Am CE*; records systems, various cor. *E Rec* Dec 21, 28-89, Jan 4-18; stand-pipe and trestle tower, rel. econ., Crocker, July 19; op. private Co's, account bks. Sep 6, 20, 27, Oct 25, Nov 15-90

*E Rec* devel. for small cities in west, Kiersted, Jan 24 *J Assoc E Socs, E News* Jan 7-88; stand-pipes formulas, table *E Rec* Apr 25, May 2-91; covered service reservoirs, Apr 30; emergency tools \* May 21; bk. keeping, June 25, Aug 6-92

*Inst C E* Typhoid fever in its relation to, Mills, abs. v 107-92, pph. rev., Lawrence, Mass., '91; covered reservoirs, Swan *Sc Am Sup* Oct 27, Nov 3-88; village supply, Terry *The Eng* Jan 20-88; news and notes, see *Eng News* files. See also DAMS; PIPES; RESERVOIRS; STAND-PIPES; VALVES; WATER AMERICAN Assoc. pro. *E News* Apr 28, 28-88, May 31, June 7-90, Apr 18, 25-91, May 19, 26-92, *E Rec* Apr 28, May 5-88, May 17-31-89?, Apr 18, 25-91, May 21, 28-92

AMSTERDAM *E News* Apr 19-90

ASHLAND, Ky., reservoir *E News* \* Apr 11-91

ATHENS, Ga., reservoir and dam, Ledlie *E News* \* May 5-88

ATLANTA, Ga., W. Richards *E News* May 26-92

AUBURN, N. Y., suction and siphon pipe *E News* \* Nov 1-90

AUSTRALIA, supply *The Eng* Sep 18, Oct 2-91

BERLIN, rules and rates, Gill *E Rec* July 9; table of consumption and sale by meter, do., dis. (very full) *Inst C E* \* v 107-92.

See also GAS and water supply, Berlin

BIRMINGHAM, Ala., Milner *E News* \* Apr 16-92

BIRMINGHAM, England, proposed sup. *E News* \* June 20 *The Eng* \* Apr 17-91

BOMBAY, India, sup. *E News* May 23-91; Hedges *E Rec* \* Dec 31-87 *The Eng*

BOSTON, Mass., Fisher hill reservoir *E News* \* Mar 24-88; lat est, n July 5-90; det. best capac. of basin No. 5, Nov 14-91; high service (full) *E Rec* \* June 1-89

BROOKLYN, N. Y., extension, insets *E News* \* Mar 7 \* May 9, Milburn eng.-h. \* June 6 \* July 25-91



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BURNLEY Corp. works *The Eng* Jan 18-88

CARDIFF supply *The Eng* Sep 16-92

CHARLOTTETOWN, Prince Ed. Is., Lea rep. *E News* Apr 6-89

CHESTER, Pa. *E Rec* \* Feb 6-92

CHICAGO, Ill., new, Feind, inset *E News* \* July 5 : submerged vs. visible intakes, Hering cor. 26-90 ; 4 mile crib, Colton *E Rec* \* Oct 10-91

CHINA and Japan, Hart, Orange, Turner *Eng* \* Feb 21 *The Eng* 21 *E News* Mar 8 Hong-Kong, Shanghai, Yokohama, dis., insets *Inst C E* \* v 100 -90

CINCINNATI, history *E Rec* Nov 8-90

CLEVELAND, O., Whitelaw dis. *E Rec* Apr 28-88

COHASSET, Mass. *E Rec* \* Dec 3-87

COVINGTON, Ky., Bouscaren, plans, insets *E News* \* May 10, 17, 17 *E Rec* \* Feb 8, 15 \* Mar 1, 1, final rep., abs. *Inst C E* v 107 -92

CROYDEN, Addington station *The Eng* \* Aug 29, Sep 5-90

DENVER, Col., Fortier *E News* \* Sep 22, 29-88

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ENGLISH towns supply *The Eng* June 15, 22-88

ETON and Winsor arbitration *The Eng* Apr 18-88

FALL River supply case *E Rec* Mar 28-89

FRANKFORT-on-Main sup., Lindley *E Rec* \* Dec 8, 15-88

FRANKLIN, N. H., covered reservoir *E News* \* May 12-92

GENESEO, N. Y. *E Rec* \* Apr 4-91

GENEVA, N. Y. *E Rec* \* Mar 14-91

GENOA, Italy, supply *E Rec* \* Jan 24-91

GOLDEN, Col., supply, n *E News* \* June 27-91

GOUVERNEUR, N. Y. *E News* Jan 24-91

HAGUE, Holland *E News* Apr 6 *Eng* \* Mar 15-89

HONG-Kong, China, Tytam, Orange *Eng* Feb 21 *The Eng* 21 *E News* Mar 8, insets *Inst C E* \* v 100 -90

HYDE Park and Lake, tunnel and inlet crib, McLennan *E News* \* Jan 12-89

INDIA, the Nágpur, Penny, abs. *Inst C E* v 93 -88, inset \* v 110 -92

ITALIAN towns supply, Bruce *Inst C E* \* v 99 -90

IVORYDALE, O., supply *E Rec* \* Dec 26-91 \* Jan 9, 23-92

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- Water-works, JAPAN, Yokohama, Turner** *Eng* Feb 21; and China, Hart *Eng* Feb 21 *The Eng* 21 *E News* Mar 8 insets *Inst C E* \* v 100-90
- KALI Nadi aqueduct failure report** *E News* May 18-89
- KANSAS** City, siphons of, Pearsons, dis. *Am C E* v 18 -88
- LEYDEN, Holland, eng.-h. and water tower** *E News* \* Dec 8-88
- LIVERPOOL, England (Lake Vyrnwy) supply** *Eng* \* Mar 30-88, inset \* Feb 1-15-89, aqued., inset \* June 17, tun. machin. \* 24 -92; *E News* \* Dec 29-88; ed. (full) \* Aug 18-92; use for hydr. power *E Rec* Sep 14-89; Parry (full) Mar 12, 19-92, insets *Inst M E* \* July -91, mechan. features, Parry, mo. power, dis., insets \* Feb; Cox *Lond Graphic* \* July 16 *R & Eng* \* Sep -92; (full) *Sc Am Sup* \* Mar 28-89; Vyrnwy aqued., Weaver nav. crossing \* July 19 *The Eng* \* May 23-90; supply \* July 31-91, (full) \* July 15-92
- LONDON, England, supply, Bolton, bk., W. Clowes, Lond.** '88; Lass, bk., W. King, Lond. *The Eng* Oct 19-88; Harrison *Eng* Mar 6-91; a London, remarkable hist. *E News* Aug 17; Lond. Co's, n. Nov 2-89; early sup. July 4-92; sup., subterranean water in chalk formation of Upper Thames, Harrison, dis., insets (full) *Inst C E* \* v 105 -91; East London *The Eng* July 5-89; sup., inquiry, ed., Jan 30, Harrison, Mar 6, Dec 4, 11, 25 -91; Met. sup. (full) \* Nov 25 \* Dec 2-92
- LOUGHBOROUGH supply** *The Eng* Jan 18-88
- MANCHESTER, England, Thirlmere, inset** *Eng* \* Oct 16, 30 \* Nov 18, 27 \* Dec 11, 25-91 \* Jan 8, insets \* 22 \* Feb 5; *E Rec* Mar 12-92
- MASSACHUSETTS, supply and sewage disposal, State Bd. of Health reports** *E Rec* Apr 18-91, abs. *Inst C E* v 98 -88, v 106 -91
- MEMPHIS, Tenn.** *E Rec* \* Sep 12 \* Dec 5, 19-91, Jan 2 \* Feb 13, 20-92
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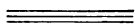
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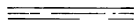
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